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ABSTRACT

This packet contains a curriculum guide, a set of lesson plans, a student manual, and a competency test packet for the Building Trades II course, the second year of a 2-year, 2-unit (350 hour) preemployment program for students in grades 11-12. This technical course is designed to develop the basic skills associated with builders. An additional 175 hours of enhancement learning is contained in these materials for districts offering Building Trades II as a 3-unit (525 hour) program. The course addresses the common essential elements for trade and industrial education dealing with leadership, employment and postsecondary training, entrepreneurship, safety, human relations and personality development, and personal business management. Following a list of common essential elements, the lessons cover carpentry, masonry, residential electricity, painting and decorating, and plumbing. The curriculum guide contains: lists of the essential elements common to all trade and industrial courses and of the essential elements specific to Building Trades II; an instructional delivery outline; a list of unit objectives and objectives specific to each topic; a list of resources; and suggestions for modifying the materials for special populations. Each lesson plan provides a list of essential elements for that lesson, objectives, identification of type of lesson, tools or equipment, materials, teaching aids, references, and activities. The student materials manual includes information sheets, assignment sheets, and job sheets, with answers to assignment sheets. The competency test package contains tests, for each lesson, that can be used either for pretests or posttests. (Answers are provided in the lesson plans.) (KC)

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BUILDING TRADES II

Educational Development and Training Center
East Texas State University

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Building Trades II

CURRICULUM GUIDE

Educational Development and Training Center
East Texas State University • Commerce, TX 75428

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BUILDING TRADES II CURRICULUM GUIDE

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PREFACE

The Educational Development and Training Center at East Texas State University is striving to provide needed materials to vocational instructors within the state.

The purpose of this publication is to assist instructors in improving instruction. As these materials are used, it is hoped that student performance will improve and students will be better prepared to assume a role in the field of building trades. This publication extends the **Building Trades I Curriculum Guide**.

Instructional materials in this publication are written in terms of student performance, using measurable objectives. This approach augments the teaching-learning process. Criterion-referenced evaluation instructions are provided for uniform measurement of student progress. In addition to evaluating recall information, teachers are encouraged to evaluate the other areas, including progress and the finished product.

The instructor should, where appropriate, reinforce the application of basic academic skills. For example, when addressing the estimating construction costs area of study, the instructor should stress to students that they will be applying specific mathematical skills such as addition, subtraction, multiplication, and division that they have learned in previous academic courses. Effective teaching practices research, and consequently the Texas Teacher's Appraisal System, emphasizes the relationship of new learning to prior or future learning. In some cases, specific academic skills needed to complete job tasks may not have yet been addressed in the academic courses in which the students have been enrolled. If this is the case, the vocational instructor should introduce and explain the academic skills, and students should achieve a level of mastery that will allow them to perform the job tasks. Instructors of vocational courses are encouraged to work closely with instructors of academic courses to ensure that students are taught fundamental academic principles correctly.

Every effort has been made to make this publication basic, readable, and by all means, usable. Three vital areas of instruction (motivation, personalization, and localization) are not included in this publication; however, they should be capitalized on by the instructor. Only then will this publication really become a vital part of the teaching-learning process.

HOW TO USE THE CURRICULUM GUIDE
FOR
BUILDING TRADES II

Building Trades II is the second year of a two-year, two-unit (350 hour) occupationally-specific pre-employment program, for students in grades 11-12. It is a technical course designed to develop those basic skills associated with builders. An additional 175 hours of enhancement learning is contained in this program for those districts offering Building Trades II as a three-unit (525 hour) program.

Organizational Design

Materials in this guide may be used in either of two ways.

It may be used to help instructors prepare their lesson plans. In this instance, the student's reference text could serve as the text. Other useful information for instructors is the instructional delivery outline, the list of essential elements common to all trade and industrial courses, essential elements for electrical trades, and the unit and topic objectives.

Or, Curriculum Guide, Lesson Plans, Student Manual, and Competency Test Packets may be purchased from:

Educational Development and Training Center
East Texas State University
E. T. Station
Commerce, Texas 75429
(214)886-5624
1-800-356-EDTC

This course addresses the common essential elements for Trade and Industrial Education dealing with leadership; employment and postsecondary training; entrepreneurship; safety; human relations and personality development; and personal business management. While the primary purpose of this guide is to assist the teacher in the course, it may be used in other ways.

Pages 5 through 6 of this guide list essential elements common to all trade and industrial courses. The listing of essential elements for this course is on page 7.

An instructional delivery outline (teaching sequence) for the course is contained on pages 9 through 20. The instructional delivery outline contains the various sections, units, and topics of instruction; listing the essential elements covered in each topic; identification of instructional materials; and recommended hours of instruction for each unit of instruction.

The next section of the guide, pages 21 through 34, provides the objectives of each unit and the specific objectives to be met upon completion of each topic. These should be particularly useful to teachers who plan to prepare their own lessons.

Page 35 of this guide lists the resources developed for this course. These materials may be used in teaching the topics of instruction. If the suggested curriculum materials listed are used, the essential element requirements will be met.

The Appendix of this guide contains information covering Modification Techniques for Special Populations.

Instructional Materials

This course is divided into six basic sections of instructional materials. The first section covers the common essential elements for trade and industrial education. It is recommended that safety be covered prior to progressing into the specific course content. The remainder of the common essential elements may be introduced into the teaching sequence at the discretion of the instructor.

The remaining sections of materials may be taught in any order. These sections are:

Carpentry
Masonry
Residential Electrician
Painting and Decorating
Plumbing

Lesson Plans

The lesson plans are intended to assist instructors and administrators of the Building Trades II program. Each lesson plan provides a listing of essential elements addressed; objectives; identification of type of lesson (cognitive or psychomotor); tools or equipment; materials; teaching aids; and references needed. Additional recommendations are made for teacher activities, student activities, evaluation/ verification, summary/closure, and reminder of upcoming lesson topics.

Included with the lesson plans are: Answers to Assignment Sheets for Building Trades II and Answers to Competency Tests for Building Trades II. These are located in Appendix A and B.

Student Materials Manual

The student materials manual includes information sheets, assignment sheets, and job sheets. The assignment sheets help the students master the technical information, while the job sheets provide applications of technical information with hands-on activities. Answers to assignment sheets are provided in Appendix A of Building Trades II - Lesson Plans.

Competency Test Package

The competency tests have been designed to serve two purposes. They may be used as pretests to access the students current level of knowledge or as competency tests to ascertain the students' level of mastery of the subject. Answers to competency tests are provided in Appendix B of Building Trades II - Lesson Plans.

BUILDING TRADES II

I. COMMON ESSENTIAL ELEMENTS FOR TRADE AND INDUSTRIAL EDUCATION

II. CARPENTRY - 195 HOURS

1. Blueprints and Working Drawings
    - A. Sectional Views
    - B. Freehand Sketching
2. Floor Systems
    - A. Slab Floors
    - B. Subfloor Systems
    - C. Plywood Subfloor
3. Stair Systems
    - A. Stairway Parts
    - B. Open Stairway
    - C. Stair Layout
    - D. Semihoused Stringer
4. Wall Systems
    - A. Story Pole
    - B. Bearing Partition
    - C. Nonbearing Partition
    - D. Metal Framing
5. Door and Window Installation
    - A. Sliding Glass Doors
    - B. Pocket Doors
    - C. Window Installation
6. Interior Finish
    - A. Moisture Resistant Wallboard
    - B. Bookcase
    - C. Floor Covering
    - D. Room Dividers
    - E. Lighting
7. Exterior Finish
    - A. Exterior Finishes
    - B. Verticle Siding
    - C. Stucco Wall
    - D. Closed Cornice
    - E. Gutters

Formula
Glossary

III. MASONRY - 50 HOURS

1. Orientation

   A. Careers in the Masonry Field
   B. Related Occupations

2. Tools and Materials

   A. Finishing Tools
   B. Heavy Equipment

3. Basic Information for Bricklaying/Stone Masonry

   A. Mortar Consistency
   B. Building a Stone Wall
   C. Cleaning Stone Work

4. Construction Processes

   A. Foundation Walls
   B. Dampproofing Walls
   C. Cavity Walls
   D. Repairing Cracks

5. Blueprints and Working Drawings

   A. Blueprint Reading
   B. Scale and Dimensions
   C. Specifications

   Formula
   Glossary

IV. RESIDENTIAL ELECTRICIAN - 55 HOURS

1. Electrical Safety

   A. Grounding

2. Electrical Theory

   A. Circuits
   B. Circuits

3. Blueprints and Drawings

   A. Electrical Floorplan
   B. Wiring Circuits

4. Electrical Installation

    A. Ceiling Fans
    B. Room Air-conditioning Units
    C. Garbage Disposal
    D. Ballast Protector

    Formulas
    Glossary

V. PAINTING AND DECORATING - 40 HOURS

1. Surface Preparation

    A. Safety
    B. Wall Preparation
    C. Estimating Paint

2. Painting

    A. Use of Primers
    B. Special Paints
    C. Special Effects

3. Wall Finish Techniques

    A. Texture
    B. Wall Coverings
    C. Estimating

    Formulas
    Glossary

VI. PLUMBING - 50 HOURS

1. Plumbing Tools and Materials

    A. Plumbing Tools
    B. Plumbing Materials
    C. Plumbing Fixtures

2. Fundamentals of Plumbing

    A. Symbols and Sketches
    B. Drainage System Repair
    C. Water System Repair

3. Plumbing Installation

    A. Installing Gas Water Heater

    Blueprint
    Formulas
    Glossary

75.88 Trade and Industrial Education

(a) The elements in this subsection are common to all trade and industrial courses unless otherwise indicated and shall be included in each course at the appropriate level. They are described here to preclude repetitions in each course. Every school offering trade and industrial education shall provide courses which include the following essential elements:

(1) Leadership concepts and skills. The student shall be provided opportunities to:

(A) demonstrate skills, characteristics, and responsibilities of leaders and effective group members;

(B) demonstrate a knowledge of parliamentary procedure principles;

(C) plan and conduct leadership activities; and

(D) prepare for effective citizenship and for participation in our democratic society.

(2) Concepts and skills related to successful employment and/or postsecondary training. The student shall be provided opportunities to:

(A) identify employment opportunities and preparation requirements in chosen fields;

(B) identify effective methods to secure and terminate employment;

(C) demonstrate effective communication skills both oral and written and follow through on assigned tasks;

(D) demonstrate dependability and punctuality;

(E) demonstrate productive work habits and attitudes;

(F) understand the importance of taking pride in the quality of work performed;

(G) recognize the dignity in work;

(H) develop skills in planning and organizing work;

(I) apply required methods and sequences when performing tasks;

(J) apply principles of time management and work simplification when performing assigned tasks;

(K) identify ethical practices and responsibilities; and

(L) understand the importance of the application of organizational policies and procedures.

(3) Concepts and skills associated with entrepreneurship. The student shall be provided opportunities to:

(A) identify opportunities for business ownership;

(B) understand the risk and profit motive factor;

(C) understand the elements and advantages of the free enterprise system; and

(D) explain the role of small business in the free enterprise system.

(4) Concepts and skills related to safety and safe working conditions. The student shall be provided opportunities to identify and apply safe working practices to all training situations.

(5) Concepts and skills associated with human relations and personality development. The student shall be provided opportunities to:

  (A) understand the importance of maintaining good health and proper appearance for effective job performance;

  (B) understand oneself and others;

  (C) exercise self-control;

  (D) accept and use criticism;

  (E) recognize basic human relationships as they relate to business success; and

  (F) demonstrate characteristics for successful working relationships.

(6) Concepts and skills related to personal and business management. The student shall be provided opportunities to:

  (A) explain how management assists in reaching personal and family goals;

  (B) explain the management process;

  (C) describe the role of management in controlling stress;

  (D) identify and understand personal checking accounts;

  (E) identify and understand personal loan application processes;

  (F) identify and understand different financial institutions;

  (G) identify the role and function of business management:

  (H) understand the lines of authority; and

  (I) identify effective supervisory techniques.

(7) Concepts and skills associated with the specific occupation being taught. The student shall be provided opportunities to:

  (A) understand the basic concepts of and develop proficiency in the occupational area for which instruction/training is provided;

  (B) develop a fundamental understanding of mathematical principles and scientific procedures;

  (C) understand terminology utilized;

  (D) identify tools, equipment, and materials used; and

  (E) develop and demonstrate appropriate techniques for the selection, use, maintenance, and storage of tools, equipment, and materials.

ESSENTIAL ELEMENTS FOR BUILDING TRADES II

(c) Building trades (two-three units) shall include the essential trade and industrial education elements and the following essential elements:

(1) Concepts and skills associated with residential carpentry. The student shall be provided opportunities to:

(A) read blueprints and work drawings;

(B) identify and estimate costs of various building materials;

(C) demonstrate appropriate concrete form setting techniques;

(D) understand concrete placement and finishing procedures;

(E) utilize appropriate framing techniques including walls, floors, ceilings, rafters, and trusses;

(F) install roof flashing and covering;

(G) understand and demonstrate proper techniques in door and window installation;

(H) identify and install various exterior and interior wall covering and trim; and

(I) understand proper techniques in stair framing.

(2) Concepts and skills associated with bricklaying. The student shall be provided opportunities to understand construction processes utilized in the construction of stonewalls, foundation walls, repairing cracks, and blueprint reading.

(3) Concepts and skills associated with residential electrician. The student shall be provided opportunities to:

(A) understand schematic diagrams and symbols; and

(B) understand the installation of electric service, wiring, and fixtures.

(4) Concepts and skills associated with painting and decorating. The student shall be provided opportunities to understand the basic principle of drywall, interior, and exterior finishes.

(5) Concepts and skills associated with plumbing. The student shall be provided opportunities to understand the process and sequence of installing external and internal plumbing in residential construction.

REFERENCE: *Building Trades I*, Unit I

INSTRUCTIONAL DELIVERY OUTLINE

(Teaching Sequence)

Units and Topics of Instruction	Essential Elements	Materials	Hours
CARPENTRY			
Blueprints and Working Drawings			15
Sectional Views	(a)(7)(A) (a)(7)(C) (e)(1)(A)	II-1-A	
Freehand Sketching	(a)(7)(A) (a)(7)(C) (e)(1)(A)	II-1-B	
Floor Systems			30
Slab Floors	(a)(7)(A) (a)(7)(C) (e)(1)(A)	II-2-A	
Subfloor Systems	(a)(7)(A) (a)(7)(C) (e)(1)(A)	II-2-B	
Plywood Subfloor	(a)(7)(A) (a)(7)(C) (e)(1)(E)	II-2-C	
Stairway Systems			30
Stairway Parts	(a)(7)(A) (a)(7)(C) (e)(1)(I)	II-3-A	
Open Stairway	(a)(7)(A) (a)(7)(C) (e)(1)(I)	II-3-B	
Stairway Layout	(a)(7)(A) (a)(7)(C) (e)(1)(I)	II-3-C	
Semihoused Stringers	(a)(7)(A) (a)(7)(C) (e)(1)(I)	II-3-D	
Wall Systems			20
Story Pole	(a)(7)(A) (a)(7)(C) (e)(1)(E)	II-4-A	

Bearing Partition	(a)(7)(A) (a)(7)(C) (e)(1)(E)	II-4-B	
Nonbearing Partition	(a)(7)(A) (a)(7)(C) (e)(1)(E)	II-4-C	
Metal Framing	(a)(7)(A) (a)(7)(C) (e)(1)(E)	II-4-D	
Door and Window Installation			20
Sliding Glass Doors	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(1)(G)	II-5-A	
Pocket Doors	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(1)(G)	II-5-B	
Window Installation	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(1)(G)	II-5-C	
Interior Finish			40
Moisture Resistant Wallboard	(a)(7)(A) (a)(7)(C) (e)(1)(H)	II-6-A	
Book Case	(a)(7)(A) (a)(7)(C) (e)(1)(H)	II-6-B	
Floor Covering	(a)(7)(A) (a)(7)(C) (e)(1)(H)	II-6-C	
Room Dividers	(a)(7)(A) (a)(7)(C) (e)(1)(H)	II-6-D	

Lighting	(a)(7)(A) (a)(7)(C) (e)(1)(H)	II-6-E	
Exterior Finish			40
Exterior Finishes	(a)(7)(A) (a)(7)(C) (e)(1)(H)	II-7-A	
Verticle Siding	(a)(7)(A) (a)(7)(C) (e)(1)(H)	II-7-B	
Stucco Wall	(a)(7)(A) (a)(7)(C) (e)(1)(H)	II-7-C	
Closed Cornice	(a)(7)(A) (a)(7)(C) (e)(1)(H)	II-7-D	
Gutters	(a)(7)(A) (a)(7)(C) (e)(1)(H)	II-7-E	

Total Hours of Basic Instruction	195

INSTRUCTIONAL DELIVERY OUTLINE

(Teaching Sequence)

Units and Topics of Instruction	Essential Elements	Materials	Hours
MASONRY			
Orientation			4
Careers in the Masonry Field	(a)(7)A) (a)(7)C) (e)(2)	III-1-A	
Related Occupations	(a)(7)(A) (a)(7)(C) (e)(2)	III-1-B	
Tools and Materials			14
Finishing Tools	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(2)	III-2-A	
Heavy Equipment	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(2)	III-2-B	
Basic Information for Bricklaying/Stone Masonry			10
Mortar Consistancy	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(2)	III-3-A	
Building a Stone Wall	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(2)	III-3-B	
Cleaning a Stone Wall	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(2)	III-3-C	

Construction Processes			12
Foundation Walls	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(2)	III-4-A	
Dampproofing Walls	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(2)	III-4-B	
Cavity Walls	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(2)	III-4-C	
Repairing Wall Cracks	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(2)	III-4-D	
Blueprints And Working Drawings			10
Blueprint Reading	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(2)	III-5-A	
Scale and Dimensions	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(2)	III-5-B	
Specifications	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(2)	III-5-C	
Total Hours of Basic Instruction			50

INSTRUCTIONAL DELIVERY OUTLINE

(Teaching Sequence)

Units and Topics of Instruction	Essential Elements	Materials	Hours
RESIDENTIAL ELECTRICIAN			
Electrical Safety			8
Grounding	(a)(4) (a)(7)(A) (a)(7)(C) (e)(3)	IV-1-A	
Electrical Theory			9
Circuits	(a)(7)(A) (a)(7)(B) (a)(7)(C) (e)(3)	IV-2-A	
Circuit Components	(a)(7)(A) (a)(7)(B) (a)(7)(C) (e)(3)	IV-2-B	
Blueprints and Drawings			10
Electrical Floor Plans	(a)(7)(A) (a)(7)(C) (e)(3)(A)	IV-3-A	
Wiring Circuits	(a)(7)(A) (a)(7)(C) (e)(3)(A)	IV-3-B	
Electical Installation			30
Ceiling Fans	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(3)(B)	IV-4-A	
Room Air-Conditioning Units	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(3)(B)	IV-4-B	

Garbage Disposal	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(3)(B)	IV-4-C
Ballast Protector	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(3)(B)	IV-4-D

Total Hours of Basic Instruction 55

INSTRUCTIONAL DELIVERY OUTLINE

(Teaching Sequence)

Units and Topics of Instruction	Essential Elements	Materials	Hours
PAINTING AND DECORATING			
Surface Preparation			10
Safety	(a)(7)(A) (a)(5)(F) (e)(4)	V-1-A	
Wall Preparation	(a)(7)(A) (a)(7)(C) (a)(7)(E) (e)(4)	V-1-B	
Estimating Paint	(a)(7)(A) (a)(7)(C) (a)(7)(E) (e)(4)	V-1-C	
Painting			12
Use of Primers	(a)(7)(A) (a)(7)(C) (a)(7)(E) (e)(4)	V-2-A	
Special Paints	(a)(7)(A) (a)(7)(C) (a)(7)(E) (e)(4)	V-2-B	
Special Effects	(a)(7)(A) (a)(7)(C) (a)(7)(E) (e)(4)	V-2-C	
Wall Finish Techniques			18
Textures	(a)(7)(A) (a)(7)(C) (a)(7)(E) (e)(4)	V-3-A	
Wall Coverings	(a)(7)(A) (a)(7)(C) (a)(7)(E) (e)(4)	V-3-B	

Estimating	(a)(7)(A) (a)(7)(C) (a)(7)(E)	V-3-C	
Total Hours of Basic Instruction			40

INSTRUCTIONAL DELIVERY OUTLINE

(Teaching Sequence)

Units and Topics of Instruction	Essential Elements	Materials	Hours
PLUMBING			
Plumbing Tools and Materials			10
Plumbing Tools	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(5)	VI-1-A	
Plumbing Materials	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(5)	VI-1-B	
Plumbing Fixtures	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(5)	VI-1-C	
Fundamentals of Plumbing			12
Symbols and Sketches	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(5)	VI-2-A	
Drainage System Repair	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(5)	VI-2-B	
Water System Repair	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(5)	VI-2-C	

Plumbing Installation			28
Installing Gas Water Heater	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(5)	VI-3-A	
Total Hours of Basic Instruction			50

OBJECTIVES

SECTION II: CARPENTRY

UNIT 1: Blueprints and Working Drawings

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to correctly read and interpret blueprints and working drawings.

TOPIC A: Sectional Views

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will correctly read and interpret the sectional and detail parts of blueprints.

TOPIC B: Freehand Sketching

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will correctly read, interpret, and develop freehand sketchings.

UNIT 2: Floor Systems

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to correctly lay reinforcement for slab floors and construct subfloors.

TOPIC A: Slab Floors

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will correctly lay reinforcement for slab floors.

TOPIC B: Subfloor Systems

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will correctly construct a tongue and groove subfloor.

TOPIC C: Plywood Subfloor

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will correctly construct a plywood subfloor system.

UNIT 3: Stairway Systems

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to correctly construct stairway systems.

TOPIC A: Stairway Parts

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will correctly identify and state the purpose of stairway parts.

TOPIC B: Open Stairway

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly construct an open stairway.

TOPIC C: Stair Layout

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly design a stair layout.

TOPIC D: Semihoused Stringers

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly construct the semihoused stringers.

UNIT 4: Wall Systems

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to correctly construct bearing partitions, nonbearing partitions, and metal frames.

TOPIC A: Story Pole

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly use a story pole for measurements to construct a wall system.

TOPIC B: Bearing Partition

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly construct the bearing partition.

TOPIC C: Nonbearing Partitions

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly construct a nonbearing partition.

TOPIC D: Metal Framing

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly construct the metal framing.

UNIT 5: Door And Window Installation

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to correctly install sliding glass doors, pocket doors, and install windows.

TOPIC A: Sliding Glass Doors

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly install sliding glass doors.

TOPIC B: Pocket Doors

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly install pocket doors.

TOPIC C: Window Installation

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly install windows.

UNIT 6: Interior Finish

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to correctly install moisture resistant wallboard, light fixtures, and floor coverings and construct bookcases and room dividers .

TOPIC A: Moisture Resistant Wallboard

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly install moisture resistant wallboard.

TOPIC B: Bookcase

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly construct a bookcase.

TOPIC C: Floor Covering

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly install floor coverings.

TOPIC D: Room Dividers

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly construct room dividers.

TOPIC E: Lighting

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly install lighting fixtures.

UNIT 7: Exterior Finish

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to correctly install exterior finishes.

TOPIC A: Exterior Finishes

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly identify and state the purpose of exterior finishes.

TOPIC B: Vertical Siding

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly install vertical siding.

TOPIC C: Stucco Wall

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly install stucco walls.

TOPIC D: Closed Cornice

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly install a closed cornice.

TOPIC E: Gutters

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly install gutters.

SECTION III: MASONRY

UNIT 1: Orientation

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to correctly demonstrate an awareness of career opportunities in the masonry field.

TOPIC A: Careers in the Masonry Field

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will correctly identify and state the purpose of career opportunities in the masonry field.

TOPIC B: Related Occupations

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will correctly identify and state the purpose of related occupations in the masonry field.

UNIT 2: Tools and Materials

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to correctly demonstrate the use of finishing tools and heavy equipment used in bricklaying/stone masonry.

TOPIC A: Finishing Tools

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly use edgers, groovers, floats, and power joint cutters, which are used in bricklaying/stone masonry.

TOPIC B: Heavy Equipment

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly use the heavy equipment used in bricklaying/stone masonry.

UNIT 3: Basic Information for Bricklaying/Stone Masonry

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to correctly mix mortar, build a stone wall, and clean stone work.

TOPIC A: Mortar Consistency

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will correctly mix mortar.

TOPIC B: Building a Stone Wall

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly build a stone wall.

TOPIC C: Cleaning Stone Work

SPECIFIC OBJECTIVE(S) After completing this lesson, the student(s) will be able to correctly clean stone masonry.

UNIT 4: Construction Processes

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to correctly construct foundation, dampproof, and cavity walls and repair wall cracks.

TOPIC A: Foundation Walls

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly construct foundation walls.

TOPIC B: Dampproofing Walls

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly construct dampproof walls.

TOPIC C: Cavity Walls

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly construct a cavity wall.

TOPIC D: Repairing Wall Cracks

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly repair cracks in brick and stone walls.

UNIT 5: Blueprints and Working Drawings

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to correctly read and interpret blueprints and working drawings.

TOPIC A: Blueprint Reading

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly read and interpret blueprints.

TOPIC B:	Scale and Dimensions
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to correctly read and interpret blueprint scales and dimensions.
TOPIC C:	Specifications
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to correctly read and interpret drawing specifications.

SECTION IV: RESIDENTIAL ELECTRICIAN

UNIT 1: Electrical Safety

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to demonstrate skills associated with electrical safety.

TOPIC A: Grounding

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly use the grounding techniques.

UNIT 2: Electrical Theory

UNIT OBJECTIVE: After completing this unit, the student will be able to constuct an electrical circuit.

TOPIC A: Circuits

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly construct the series and parallel circuits.

TOPIC B: Circuit Components

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to use the color code, correctly identify, and install circuit components.

UNIT 3: Blueprints and Drawings

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to demonstrate the knowledge and ability to read and interpret blueprints and drawings.

TOPIC A: Electrical Floor Plans

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly read and interpret electrical floor plans.

TOPIC B: Wiring Circuits

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to use the blueprint correctly to wire circuits.

UNIT 4: Electrical Installation

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install ceiling fans, room air-conditioning units, garbage disposals, and ballast protectors.

TOPIC A: Ceiling Fans

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly install ceiling fans.

TOPIC B: Room Air-Conditioning Units

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly install room air-conditioners.

TOPIC C: Garbage Disposal

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly install a garbage disposal.

TOPIC D: Ballast Protector

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly install ballast protectors.

SECTION V: PAINTING AND DECORATING

UNIT 1: Surface Preparation

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to apply safety principles when preparing walls and will be able to accurately estimate paint.

TOPIC A: Safety

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will correctly identify and analyze safety principles associated with surface preparation.

TOPIC B: Wall Preparation

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly prepare wall surfaces.

TOPIC C: Estimating Paint

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to accurately estimate paint.

UNIT 2: Painting

UNIT OBJECTIVE: After completing this unit, the student will be able to correctly apply primers, special paints, and special effects.

TOPIC A: Use of Primers

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly apply primers.

TOPIC B: Special Paints

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly apply special-type paints.

TOPIC C: Special Effects

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly apply special effects.

UNIT 3: Wall Finish Techniques

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to correctly apply textures and wall coverings and accurately estimate their cost.

TOPIC A: Textures

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly apply different types of textures.

TOPIC B: Wall Coverings

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly apply wall coverings.

TOPIC C: Estimating

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly estimate wall finish techniques.

SECTION VI: PLUMBING

UNIT 1: Plumbing Tools and Materials

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to correctly use plumbing tools and materials when installing plumbing fixtures.

TOPIC A: Plumbing Tools

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly use plumbing tools.

TOPIC B: Plumbing Materials

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly use plumbing materials.

TOPIC C: Plumbing Fixtures

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly install plumbing fixtures.

UNIT 2: Fundamentals of Plumbing

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to correctly interpret symbols and sketches when repairing drainage and water systems.

TOPIC A: Symbols and Sketches

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly read and interpret plumbing symbols and sketches.

TOPIC B: Drainage System Repair

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly repair drainage systems.

TOPIC C: Water System Repair

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly repair water systems.

UNIT 3: Plumbing Installation

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to correctly install gas water heaters.

TOPIC A: Installing Gas Water Heater

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to correctly install gas water heaters.

RESOURCES DEVELOPED FOR BUILDING TRADES II

Building Trades II, Curriculum Guide, Educational Development and Training Center, East Texas State University, E. T. Station, Commerce, Texas 75429 Catalog # TI-350-CG

Building Trades II, Student Materials Manual, Educational Development and Training Center, East Texas State University, E. T. Station, Commerce, Texas 75429 Catalog # TI-350-SM

Building Trades II, Competency Test Packet, Educational Development and Training Center, East Texas State University, E. T. Station, Commerce, Texas 75429 Catalog # TI-350-CTP

Building Trades II, Lesson Plans, Educational Development and Training Center, East Texas State University, E. T. Station, Commerce, Texas 75429 Catalog # TI-350-LP

APPENDIX

MODIFICATION TECHNIQUES FOR SPECIAL POPULATIONS

ACKNOWLEDGEMENT

The module 7 Overview of the Vocational Special Needs Teacher Training Curriculum has been reprinted with permission as this appendix. Teachers are encouraged to refer to the original publication to learn more about working with special needs populations. The character font size and line spacing have been changed in this appendix to save space.

The project was developed in 1987 by Craig R. Colby, Ed.D. of Texas A&M University. Linda H. Parrish, PH.D., Texas A&M University, and Jerry L. Wircenski, Ph.D., North Texas State University, were the project directors.

The vocational special needs teacher training curriculum was developed pursuant to a contract with the Texas Education Agency's Vocational Education Special Projects. Contractors or grantees undertaking such projects under Agency sponsorship are encouraged to freely express their professional judgement in the conduct of the project. Points of view opinions stated do not, therefore, necessarily present official Texas Education Agency position or policy.

This information is presented as an appendix to help Trade and Industrial teachers with planning the modification of instruction for special populations. Many of the concepts and ideas presented are sound practices to be used with normalpopulations.

The entire 10 module training curriculum is available through the University of Texas at Austin. The modules in the vocational special needs teacher training curriculum are as follows:

Module 1	How to Use the Modules
Module 2	Federal Legislation
Module 3	Learner Characteristics
Module 4	Vocational Assessment
Module 5	Coordinated Planning
Module 6	Interagency Cooperation
Module 7	Modifications
Module 8	Generalizable Skills
Module 9	Serving LEP Students
Module 10	Student Evaluations

CURRICULUM MODIFICATION

The term "vocational curriculum" can be defined as the organized content of a particular discipline which a student must master to attain an occupational goal. It involves the sum total of all experiences and learning activities encountered in the classroom. A curriculum is concerned with results. It encompasses "what is to be taught" and "what is to be learned" (Stern-Otazo, 1980; Goh & Sitlington, 1983).

As discussed in previous modules, each student has a mental capacity, physical skills, and various needs which vary from one individual to the other. In addition, students exhibit different learning styles. All good teachers recognize this and will work toward developing a classroom environment which is characterized by a deep respect for the learner, acceptance of student, fulfillment of individual needs, and individual development. This is what is meant by the teacher who has become "learner-centered" and not "content-centered" (Pine & Boy, 1977). Jones (1977) eloquently describes recognizing individual worth and individual development as being the basis for curriculum development as follows:

> **Individual development** as a basis for curriculum perspective would lead us to teach discovery of principles and sacredness of the individual personality. It would teach the learners to view themselves as self-actualizing individuals in a setting designed to support and encourage personal development to the ultimate of one's potential. Attempts to improve the local community would center around providing a richer and fuller life for personal growth and development. Good people make good communities, good states, good nations, and good world. By emphasizing development of individuals, such a curriculum would hope to plant the seed for a better world in the future.

Therefore, all learners should be perceived as a very "special" individuals who one day will take their place in society. It is the responsibility of educators to assist **all** learners (in spite of their shortcomings) to become productive members of society. This can be accomplished by helping each student establish attainable career goals and then providing meaningful experiences through which the student can achieve these goals. Every student should be treated with dignity, as an individual who has unique strengths and interests in life. It is not necessary or even realistic to expect every student to do and know all the same things. As stated by Jones (1977), "Learners should become worthwhile persons in their own right,...it is not necessary that they all become miniature images of the same pattern."

Purpose of Curriculum Modification

When working with students with special needs, a learner's curriculum may need to be modified or adjusted to take into account major differences which could be found among these individuals. The term "curriculum modification" can be defined as tailoring an existing curriculum to the unique needs of students as they pursue an occupational goal (Sarkees & Scott, 1985; Goh & Sitlington, 1983). However, it should be strongly emphasized that modifying a curriculum does not mean that an educator should lower or alter the standards of his or her program. What it does mean is that the Admission Review and Dismissal (ARD) Committee (for handicapped students) or coordinated planning team (for disadvantaged and LEP students) determines which essential elements in the regular school curriculum would be appropriate for a student's needs. The State Board Of Education Rules For Curriculum offers the following key points (Texas Education Agency, 1985):

1. For students with special needs, school districts shall provide modifications in methodologies, pacing, and materials to ensure that instruction is delivered, as appropriate, in the essential elements.

2. Students with special needs shall be instructed in those same essential elements in a manner appropriate to their needs.

3. School districts shall implement the provisions (under Chapter 75) in a manner which will enable all students to participate actively in a well-balanced curriculum and master, to the best of their abilities, the knowledge, skills, and competencies established through the essential elements.

4. Specialized personnel and regular program personnel shall be jointly responsible for the cooperative delivery of effective instruction in the essential elements, as appropriate.

It is important to re-emphasize that special needs students, as all students, have capabilities which widely vary. The challenge parents, educators, and vocational counselors face is to help each learner reach occupational goals which are within the student's potential.

The Curriculum Modification Process

In developing a meaningful and challenging vocational curriculum, for a special needs learner, the ARD Committee or coordinated planning team should carefully review the student's vocational assessment information which consists of: (a) the student's capabilities, (b) parent and student interviews (including the career expectations of the learner), (c) the student's vocational interests and abilities, and (d) the teacher's informal behavioral assessments of the student.

After reviewing this information, the planning team can then work toward developing realistic and appropriate vocational goals for the student. Important items to consider when developing vocational goals include: (a) community employment needs, (b) vocational readiness skills, (c) multiple exit points (jobs that a learner can prepare for in the vocational program), and (d) entry-level competencies expected by employers for each of the exit points. In this way, the learner would be aware of realistic employment opportunities, specific skills needed for entry into a vocational program, and specific objectives which must be fulfilled in reaching an employment goal.

A number of special education curriculum models have been designed which take into account both the needs of a vocational program and the needs of the learner. The basic components which many of the designs have in common are as follows:

1. The importance of working with existing vocational curricula.
2. The importance of building upon the student's interests and competencies.
3. The identification of long range vocational goals and short range objectives--which are stated in measurable terms.

For the purpose of this overview, the competency-based curriculum modification model has been selected for discussion.

The Competency-Based Curriculum

Over the years, the concept of competency-based curriculum has increased in popularity largely due to the emphasis on accountability in education (Choate, et al., 1987). In addition, since the passage of P.L. 94-142, vocational educators have had to adjust their curricula to take into account the capabilities of special needs learners.

The underlaying principle behind the competency-based curriculum is to assist the student in becoming a more effective person. This entails helping the student develop skills or competencies which will promote employment opportunities and a higher self-esteem within the student (Brolin, 1976; Lippmann & Porter, 1976). The ability to succeed is what makes competency-based learning so valuable for students with special needs (Kok, 1978). With competency-based learning a student does not have to wait until the end of the program to experience success. The sequential steps called for throughout the program afford the possibility of success on a day-to-day basis (Lippmann & Porter, 1976).

The concept of competency-based learning is relatively simple. Based upon the learner's assessment information, the educator establishes specific goals (competencies) which will help the student "function adequately as a consumer, a producer, a learner, and a citizen" (Parnell, 1973). For example, in an auto mechanics class, the student's occupational program goals or competencies may include one or more of the following: (a) performing a simple lubrication, (b) repairing a tire, (c) changing the battery, (d) completing an engine tune-up, (e) completing a valve job, (f) fixing the carburetor, or (g) overhauling the engine. Next, the educator develops objectives and an individualized instructional plan for the student to follow.

This individualized instructional plan includes: (a) an objective, (b) an introduction, (c) a learning activity, (d) a test/checklist, and (e) answers/feedbacks.

Therefore, in competency-based learning it is not necessary or even realistic for the instructor to expose every learner to all the aspects of a vocational program. Competency-based learning focuses on the quality of learning rather than the quantity of learning such that the student who has limited skills could still find employment (Kok, 1978).

Gills's Four-Step Model

An excellent competency-based paradigm or model which can be utilized by vocational educators to maximize a learner's vocational potential was developed by Douglas H. Gill (Sarkees & Scott, 1982). The design of Gill's model involves the use of four sequential steps and utilizes the regular vocational curriculum as a basis for the modification process.

Step one. The first step in Gill's model requires the educator to gain a clear picture of the existing curriculum any student would follow in a particular vocational program. Gill calls this step "Establishing the Curriculum Framework." The purpose of this step is to organize the existing curriculum in such a way that it can be modified. This step involves: (a) identifying the overall long-range goals of the vocational program, (b) identifying and listing the short-term objectives that sequentially comprise each long-range goal, and (c) identifying the instructional units which comprise a sequence for attaining each short-term objective. An example of a curriculum framework which outlines an overall long-range goal, short-term objective, and instructional units follows:

1. **Long range goal:** Given appropriate tools, equipment and materials, the student will be able to demonstrate instructor specified job entry level skills in the masonry area of construction trades at a comparable rate of time and accuracy to that found on the job.

2. **Short term objective:** The student will be able to demonstrate the basic skills of bricklaying.

3. **Instructional units:** Spreading mortar. Laying brick to a line. Building a brick corner. Cutting brick and block.

Once the long range goals, short term objectives, and instructional units have been outlined for a particular vocational program, the educator can begin the work of modification for a special needs learner.

Step two. Step two of Gill's four-step model, "Developing an Instructional Task Analysis," builds upon step one. The instructional task analysis lists the tasks that, when sequenced, make up the instructional unit. In this step the educator identifies the required tasks the student must perform, emphasizing what the student must do rather than what the student must read or write. An example of instructional tasks for one of the instructional units above follows:

1. **Instructional unit:** Spreading mortar.

2. **Instructional tasks:** Mix mortar.
   IdentiIdentify and use trowel.
   Identify and use mortar board
   Wet mortar board.
   Place mortar on board.
   Bunch mortar.
   Load trowel.
   Distribute mortar.
   Furrow mortar.
   Cut excess mortar.
   Seat mortar to trowel.
   Butter brick.
   Butter head joint.
   Lay one brick to another.
   Identify and explain purpose of running half-bond.

Therefore, establishing the curriculum framework and required instructional tasks (task analysis) organizes the instructional process and prepares for the next step in the process.

Step three. The third step in Gill's four-step model represents the implementation stage. This step, "Developing the Curriculum Supplement," involves developing usable supplements for the existing curriculum. The curriculum supplement is designed to be used jointly by the instructor and the resource support person. The curriculum supplement is composed of two major parts: (a) the Learning Plan and (b) the Supplemental Learning Plan.

The Learning Plan is used primarily by the instructor and consists of the following four basic parts:

1. Instructional unit
2. Instructional task
3. Performance-based task activities
4. Performance-based task check

The instructional unit and instructional task are components of the curriculum framework. The performance-based task activities describe for the instructor those task elements the student will do. The performance-based task check is a measurement of the student's ability to master the task at hand.

The Supplemental Learning Plan was developed for use primarily by special needs support personnel and consists of the following six basic parts:

1. Instructional Unit
2. Instructional task
3. Task terminology
4. Essential math operations
5. Coordinated movements
6. Related concepts

The purpose of the Supplemental Learning Plan is to identify basic knowledge (task terminology, essential math operations, important concepts) and prerequisite skills (coordinated movements, related concepts) the learner must posses in order to complete an instructional task. The Supplemental Learning Plan can be very useful in helping the resource teacher and instructor identify those areas where instruction support may be needed. It is, therefore, very important that the Learning Plan and Supplemental Learning Plan be developed by the instructor, special education teacher, or support/resource teacher for each instructional task. In this way, if a learner has difficulty mastering a specific task, individualized activities can be developed by selected individuals to help the student resolve the problem.

Step four. The fourth and final step of Gill's model is the development of an individualized student module. The student's module is created from the Learning Plan and Supplemental Learning Plan and is the culmination of the curriculum modification process. The student's module consists of the following four components (Goh & Sitlington, 1983):

1. **Word section:** Includes terms identified on the supplemental learning plan, along with definitions of each term.
2. **Job tasks:** Definition of each step in the job. This appears in the student module under the heading "What You Do."

3. **Illustrations of job tasks:** The illustrations help clarify the job steps and should be clear and precise, without being complex.

4. **Evaluation procedures:** Both enroute (formative) checkups and a final (summative) performance check are included to assess the learner's progress through the module.

The student's module is tailored to help meet the specific needs of a learner and serves as a guide to assist the student in achieving instructional tasks. Various ways in which a student's module can be individualized to take into account the various learner differences found in the training setting are as follows (Goh & Sitington, 1983):

1. The amount of detail and illustrations can be varied to take into account learner differences in intellectual abilities and educational backgrounds.

2. The mode of presentation can be altered to meet the needs of learners with differences in learning styles (e.g. audio-cassettes can be added for auditory learners).

3. The amount of feedback from the module and instructor can be increased or decreased to match differences in motivation, perseverance, and tolerance levels.

In summary, Gill's four-step model is a competency-based process flowing directly from the regular vocational curriculum. The steps range from establishing a curriculum framework to developing an individualized student module. Gill's model is not designed to replace or lower the standards of the regular vocational curriculum. It is a systematic process by which a special needs student can achieve solid vocational goals through the cooperative support of vocational instructors, special educators, and support personnel.

Responsibilities of the Vocational Educator

The primary responsibility of the vocational educator in the curriculum modification process is to help the special needs student establish and reach realistic occupational goals. In an effort to accomplish this, the vocational educator must identify the following (Sarkees & Scott, 1985):

1. Pertinent information about what will be taught in a vocational program.

2. Necessary requirements for program completion.

3. Multiple exit points (jobs that the learner can prepare for in a vocational program).

4. Entry level competencies expected by employers for each of the exit points.

It is also the responsibility of every vocational educator to establish an effective and wholesome learning environment for their students. Providing this environment may involve modifying the vocational facility, equipment, tools and/or instruction. This information will be provided in the following section.

MODIFICATION OF THE LEARNING ENVIRONMENT

The term "learning environment" refers to both the physical and instructional setting of the vocational classroom/laboratory (Bell, 1984). It is the responsibility of each vocational educator to work at developing a learning environment which will contribute to the overall well-being and success of every student. The key factors found in wholesome learning environment are those which promote:

1. **Safety, organization, and physical comfort.** in the vocational laboratory, it is absolutely crucial that each student abide by safety rules set by the instructor. In addition, the laboratory should be kept well organized and clean. A laboratory which is safe, well organized, and physically comfortable helps promote high morale and good work habits.

2. **Respect and acceptance.** Within an effective learning environment, students will show respect not only for the instructor but for each other as well. The instructor should be the student's best role model. The care and acceptance given by the instructor to each student (disabled or non-disabled) will go a long way in promoting peer acceptance, a positive attitude, and healthy self-esteem.

3. **Discipline.** A wholesome learning environment is one which promotes discipline and a positive self-concept within each student. Inappropriate behavior has the potential to seriously affect classroom safety, morale, and the overall learning process. Ways in which the instructor can help the student modify inappropriate behavior include: (a) utilizing the time-out technique, (b) developing student-teacher contracts, (c) ignoring negative behavior--whenever possible, and (d) rewarding appropriate behavior with approval and praise.

4. **Flexibility.** An effective learning environment is flexible and can adapt to a special student's unique needs (i.e., slower rate of learning, inability to access regular tools/equipment, or remedial needs in reading or math for instance). A flexible environment fosters individualized programs through which a special learner can develop marketable skills for employment.

Modifying Facilities, Equipment, and Tools

In the past, many special needs learners have been denied their basic right to a public education because of architectural barriers, nonadaptive facilities, equipment, and tools (Phelps & Lutz, 1977). However, federal legislation has done a great deal to provide equal access to educational programs for every learner. For example, according to Section 503 of the Rehabilitation Act of 1973, each federally funded program or activity in which a handicapped individual can enroll and profit must be made accessible to the student (Sarkees & Scott, 1985). In addition, the Carl Perkins Act of 1984 has emphasized the importance of providing supplemental services for special needs learners, which include the adaptation of facilities, equipment, curriculum, and instruction (Cobb & Kingburgy, 1985).

Modifying facilities. A barrier-free facility planned for safety, efficiency, and convenience is of vital importance to individuals with special needs--especially those who are in wheelchairs, on crutches, or have artificial limbs. According to Sarkees & Scott (1985), three major areas in which architectural barriers may be present at most vocational education facilities are:

1. **Getting to and entering the building** -- getting to the ground from public or private transportation; parking; negotiating parking lot pavement, curbs, walkways, ramps, and stairways; and entering exterior doors.

2. **Moving about inside a building** -- moving through corridors and hallways; moving from floor to floor; identifying and entering classrooms, laboratories, and auxiliary areas; moving through aisles and traffic lanes inside classrooms and laboratories.

3. **Using school fixtures, appliances, and study/work station area equipment** -- using restrooms, drinking fountains, vending machines, tools, machines, and work station apparatus.

In an effort to eliminate these barriers, vocational educators, planners, and administrators should contact the State Architectural Barriers Board or State Department of Education regarding the guidelines and standards that have been developed for compliance with federal mandates. The federal government has adopted the American National Standards Institute (ANSI) accessibility standards as its mandatory guidelines for removal of architectural barriers (Sarkees & Scott, 1985).

Modifying equipment and tools. Based upon the needs of each special learner, it may become necessary to modify existing equipment and tools to accommodate the special needs student. The degree of modification will depend upon the type and extent of each student's impairment. It should be remembered, however, that equipment should be modified only to the extent necessary to assist the student. Whenever possible, as the student generates competence in a learning task, the modified equipment should be replaced with regular equipment (Phelps & Lutz, 1977). The following are some general suggestions in which equipment and tools can be modified for specific classifications of special needs students (Phelps & Lutz, 1977; Sarkees & Scott, 1985; Stern & Gathercoal, 1986):

Important Note: It is very possible that a number of these suggestions could apply to more than one category.
Furthermore, some of these modifications may be applicable to disadvantaged and LEP students. This, of course, would depend upon the needs of the particular student.

Modifications for Orthopedically-Impaired Students

1. Work benches can be cut out so that wheelchair bound students can pull up close to the work surface.

2. Modify the height of workbenches, storage cabinets, table tops, etc. to make them accessible to wheelchair bound students.

3. A lap board can be fitted on the arms of the wheel chair to provide a work area.

4. Rearrange storage areas for tools and supplies to make them accessible and as near to the work station as possible.

5. Position bench-mounted power tools on the ends of benches.

6. Semistationary equipment should be put on variable height bases.

7. Modify machine controls so that they can be operated with prostheses such as an arm hook.

8. Replace cabinet knobs with levers or handles.

9. Convert knob-type ON-OFF switches to toggle switches, levers, or slide-adjustment mechanisms.

10. Provide an aid that increases mechanical advantage in manipulating controls.

11. Convert machines and equipment that have hand controls to the foot pedal type for students who have upper extremity disabilities.

12. Select machines that do not require two-handed operation, such as a radial arm saw instead of a table saw.

13. Place small parts of instruments on a foam pad to aid students in picking them up.

14. Select tools that require only one hand to operate, such as split screwdrivers, which hold screws and bolts for starting.

15. Provide holding devises such as vacuum vises, stationary vises, clamps, jibs, and fixtures that permit one-handed operation.

16. Provide tools that supply more mechanical advantage to loosen or tighten screws or bolts, such as a lever-type socket set or an offset screwdriver.

17. For students who have weak hands, increase the size of tool handles by replacing them with larger diameter handles or by enlarging them with tubing or tape wrappings.

18. Provide templates to aid drafting students who have trouble manipulating standard drafting instruments.

Modifications for Hearing-Impaired Students

1. Install a red light next to the on-off switch so that the student can tell when the machine is in operation.

2. Install amplification devices on auditory warning signals so that they can be heard by those with partial hearing.

3. Use visual timers in place of those that emit sounds.

Modifications for Visually-Impaired Students

1. Purchase commercially available measuring tools with raised or engraved markings that can be read by touch.

2. Purchase measuring devices that provide auditory signals.

3. Brailled tape or raised marks can be used on control dials and switches.

4. Enlarge markings on tools, tool holders, or machine controls.

5. Provide jigs, guides, and templates to aid students in positioning and guiding tools.

6. Identify controls by changing their size, shape, or texture.

Modifications for Mentally-Impaired Students.

1. Color code important parts of machines or equipment.

2. Devise jigs, fixtures, templates, and guides to simplify work task operations.

Modifications for Limited English Proficient Students

1. Utilize name placards (Spanish and English) for machines, tools, and equipment.

2. Color code or use symbols for dangerous machines. For example, one red dot could indicate a dangerous machine and two red dots could indicate a very dangerous machine.

A wide variety of specially designed aids, tools, machines, and equipment are commercially available to assist the special needs learner. Occasionally, this material can be paid for through vocational rehabilitation centers or the school's special education program. Information pertaining to manufactured devices can be found in school supply catalogs or in catalogs published by special institutes. A very comprehensive resource has been developed by the Wisconsin Studies Center, University of Wisconsin-Madison, entitled Tools, Equipment and Machinery Adapted for the Vocational Education and Employment of Handicapped People. In addition, information is available through the school's special education personnel and vocational rehabilitation counselors (Sarkees & Scott, 1985).

In conclusion, two educational topics have been presented which are **fundamental components** to the successful instruction of learners with special needs: (a) developing or tailoring an appropriate curriculum and (b) establishing a favorable learning environment. Within the final section of this Overview, basic principles will be presented which will address the actual instruction of special learners.

MODIFICATION OF INSTRUCTION

The primary purpose of this section is to provide the vocational educator with teaching strategies and techniques that will be useful when instructing students with special needs. It is important to remember that the methods and approaches used by educators when instructing non-special needs students may not be very effective with students with special needs (Gleiss-Monar & Sitlington, 1983). Therefore, individualizing instruction becomes vitally important in the successful instruction of special learners.

Within this section, the following topics will be discussed: (a) learning styles, (b) teaching strategies, (c) remediation techniques, and (d) Brown's 3-Cs Instructional Mode.

Learning Styles

Each special learner has unique needs and these needs affect how the student can best learn. For example, if a student is blind or has difficulty with "visual" learning, the instructor should stress the learner's sense of sight. Therefore, the manner in which a student with special needs learns ceases to be a preference, but becomes instead a necessity (Kok, Jernigan, & Hull, 1978). Further, one of the main philosophies behind individual learning styles is that learning should be a pleasant and successful experience. Educators, therefore, should adjust their style of teaching to allow students the benefit of learning in their preferred manner (Kok, Jernigan, & Hull, 1978).

Identifying a student's learning style.

The following are methods in which an educator can identify a student's learning style:

1. **Informal observation**. One of the simplest and possibly best ways to identify a student's learning style is through informal observation. By observing the student as he or she negotiates classroom/laboratory learning activities, the educator can collect valuable information with regard to the student's learning style. For example, the educator may observe that a disadvantaged student answers questions in class and does well with hands-on activities but repeatedly fails written exams. If the primary intent of the instruction is to reach vocational skills rather than reading and writing skills, the instructor could modify their style of teaching by allowing the student to take oral and/or hands-on exams (Kok, Jernigan, & Hull, 1978: Sarkees & Scott, 1985).

2. **Teacher consultation**. Consulting other teachers (i.e., special education teachers, resource room teachers, support personnel, paraprofessionals, and other vocational education teachers) can be an excellent source for information regarding a student's learning style (Sarkees & Scott, 1985).

3. **Student/parent interviews**. Interviewing the student and student's parents/guardians can result in valuable insights as to the student's best learning modes (Sarkees & Scott, 1985)

4. **Standardized inventories**. Standardized inventories provide an alternative for students who are shy or uncomfortable during a personal interview. Information received from interest, personality, and learning style inventories can provide valuable information with regard to the student's learning style (Kok, Jernigan, & Hull, 1978; Sarkees & Scott, 1985).

Teaching Strategies

Once the student's vocational goals, learning capability, and preferred learning style have been identified, the educator can begin to experiment with a variety of teaching techniques and instructional materials. When determining the teaching technique and instructional material best suited to meet a student's unique needs, it is important for the educator to be patient, open-minded, and flexible. Not every instructional technique and/or material can be used successfully with each learner (Sarkees & Scott, 1985). In addition, the educator should not hesitate to enlist the support of other instructors, school counselors, student aides, paraprofessionals, volunteers from the community, itinerant teachers, and/or interpreters. This pooling of efforts can result in increased student learning because of the variety of approaches and personal attention which can be brought to the classroom or laboratory (Harrington & Fardig, 1982).

The following are general guidelines and instructional techniques which an educator can use to help meet a special needs learner's unique needs and learning style:

1. **Orientation**. Students with special needs may need additional orientation with regard to: (a) the relevancy of their individualized goals, (b) class procedures, (c) safety, etc.

2. **Flexible pacing**. Students with special needs can exhibit different rates of learning. The educator should provide flexibility in pacing of instruction and assignments to meet the various needs of learners. In general, students with special needs should be individually paced to maintain their progress and interest, yet avoid the frustrations and failure undue pressure may cause (Harrington & Fardig, 1982; Sarkees & Scott, 1985).

3. **Demonstration**. Utilization of the demonstration method can be very effective in introducing a new skill to a learner with special needs.

4. **Breaking material into small distinct steps**. As a general rule, it is important for the educator to break a learning concept into small distinct steps. In this way, the educator can best identify where the student is experiencing difficulty.

5. **Positive environment and feedback**. In general, students with special needs lack confidence and a positive self-concept. This is primarily due to their not having had much success in life. In addition, the few successes special learners do have usually result in little, if any, positive reinforcement (i.e., praise, reward, and/or encouragement). Therefore, it is incumbent upon educators to create a positive, nonthreatening learning -- environment for their students and to make generous use of positive feedback when the student experiences success. Constructive criticism should not be avoided; however, it should be given in a positive manner (i.e, students should understand that their behavior or product is what's being criticized and not their worth as a human being). Finally, all students must learn that mistakes and constructive criticism are a normal and expected part of life (Harrington & Fardig, 1982).

6. **Use of peer tutors, college students, and volunteers**. Use of peer tutors, college students, and volunteers can greatly assist a vocational educator's work with special learners by: (a) helping with individualized instruction, (b) providing positive role models, (c) increasing student participation, (d) increasing the special learner's success experiences, (e) increasing the student's confidence and self-esteem, and (f) improving the special learner's social and academic skills (Asselin & Anderson, 1986). In addition, peer tutors, college students, and volunteers can receive teaching experience and the satisfaction of helping individuals with special needs progress.

7. **Flexible grouping**. The educator can integrate special needs learners into groups of various sizes (according to the student's goals, interests, or ability level) and utilize peer tutors, college students, and volunteers for assistance. According to Sarkees & Scott, grouping students has the following advantages: (a) it allows the teacher more time to work among the students, (b) it allows the teacher to individualize instruction, tasks, and assignments to meet the needs of students in a specific group, (c) it provides special needs learners with an opportunity to work with peers and establish positive interpersonal and working relationships with them, (d) it serves as a motivating factor for special needs learners because the individualized nature of the group work does not become threatening or frustrating but allows students an opportunity to work at their own pace through their strongest learning style, (e) it allows teachers to arrange for instruction for the entire class, small group discussions, project groups, and small remedial sessions so that instruction will be diversified and more meaningful for all students; and (f) it allows the teacher to modify the task or assignment for a small group of students with specific needs, as in the case of learners who have a physical disability (Sarkees & Scott, 1985).

8. **Providing field trips and job site visits**. Schedule field trips and job site visits van give all learners a realistic first-hand look into the real world of work. By "shadowing" workers in a particular occupational area, students can gain helpful insights into their own career decision. In addition, a field trip or job site visit can be very motivational in that the student can readily observe how his/her vocational training will be used in the world of work (Sarkees & Scott, 1985).

9. **Use of media.** Utilizing media can embellish instruction by: (A) assisting the teacher in presenting the proficiency or skill requirements for a specific job, (b) reinforcing concepts presented in a classroom, laboratory, or demonstration activity, (c) providing a vehicle for special needs learners to show what they have learned, (d) providing a valuable source of remedial assistance, (e) providing simulated learning experiences, (g) allowing special needs students to learn through their strongest style, and (h) adding variety to the instructional program. Examples of media include: computer assisted instruction (CAI), 16 mm films, film strips, flip charts, overhead transparencies, tape recorders, records, posters, magazines, and diagrams (Sarkees & Scott, 1985).

10. **Use of student-teacher contracts.** Student-teacher contracts can be excellent tools in helping learners with special needs achieve their vocational goals. The following guidelines should be used in developing and implementing a student-teacher contract: (a) decide on the task or project; (b) specifically state the requirements, (c) determine the minimum acceptable accuracy, (d) set a time limit--initially, short assignments and short time periods are usually best, (e) identify consequences, (f) discuss contract with student and support personnel, (g) have all parties sign the contract, (h) positive reinforcement should be given if the terms of the contract are satisfactorily met, (i) uncompleted contracts should be analyzed by the teacher and student to determine the causes, and (j) develop new contracts cooperatively (Sarkees & Scott, 1985).

The following is a list of specific teaching strategies which educators can utilize when addressing the unique needs of handicapped students (Sarkees & Scott, 1985; Stern & Gathercoal, 1986: Tindall, 1980):

Important Note: It is very important to note that many of these teaching strategies could be used for all students. Appearing later in this Overview is a listing of instruction strategies which could be generic to all special needs students.

Instructing Students Who Are Mentally Impaired

Involve as many different senses as possible in the learning process.

Use concrete specific terms rather than abstract terms. If necessary, have the student repeat the necessary information to you.

When giving written directions use lists instead of paragraphs. With regard to the student who can barely read, contact the remedial reading staff and arrange reading instruction. This instruction should focus on required reading for your course and that which is vital for employment.

Teach by demonstration (whenever possible). Don't hesitate to use hand-over-hand assistance in demonstrating how to use a tool or machine.

Allow time to practice machine or tool processes.

Break down complex operations into smaller tasks.

With regard to feedback, let the learner know what is wanted, and whether or not the student is achieving it. Give lots of positive reinforcement and encouragement. Nonverbal feedback is also helpful (i.e. touching the student or task pointing, blocking or stopping an error as it is developing, and guiding the learner's movements. In addition, provide specific feedback with regard to the student's work. For example, the educator should say, "This piece was cut exactly to the right size," or "You put these two parts together correctly, " or use Mark Gold's expression "Try another way" (Gold, 1975).

Build the student's confidence by: (a) utilizing activities that will assure success, (b) assigning special tasks which will communicate with the educator's confidence in the student, (c) giving students an opportunity to correct their work and hand in a good project or assignment, and (d) displaying the student's good work.

In helping students with their ability to make correct discriminations, utilize Gold's "match to sample" technique in which the student is provided an example and a number of choices. The student will choose the correct alternative based upon the characteristics of the sample (Gold & Scott, 1971).

With regard to helping the student make correct discriminations when there are minimal differences between the stimuli, it may be necessary to: (a) present the choices in an easy form at first, (b) exaggerate attributes, (c) make the choices gradually harder, or (d) add and fade out color cue, add and then gradually remove large cue differences, or combine these two approaches.

Retention/memory can be improved by: (a) being systematic and presenting one new piece of learning at a time, (b) relating new material to familiar material, and keeping it practical and concrete, and (c) utilizing training techniques such as the total task method, chaining, modeling/demonstrating, and the structured overview (see Tindalls' Puzzled About Educating Special Needs Students).

"Generalizing", or having the student apply what has been learned to the contexts, can be improved by: (a) using examples from different relevant contexts and (b) practicing in settings similar to or exactly like those that will be encountered on the job.

Instructing Students Who Are Hearing-Impaired

In private, discuss with the student his/her ability to communicate with you (lip/speech reading, use of hearing aid, writing, signing, and total communication). An open discussion with the student which demonstrates your concern as an educator is an excellent beginning in building rapport.

Body language communicates messages too. Remember not to give mixed messages with your body language. Also, be alert to the body message the student is giving you (i.e., is he/she communicating tension, nervousness, avoidance, or confusion?)

If you will be working with an interpreter, do not instruct the deaf student as if he/she were a third party. Speak directly to the student. Also, remember that the interpreter is ethically bound to interpret everything you say. Therefore, sensitive or other issues concerning the student is best addressed in a meeting before or after class. If you are using media where the room must be darkened, focus a small lamp on the interpreter.

Maintain good eye contact with the student while speaking.

Speak slowly and clearly, pronouncing each word, but without exaggerating or over pronouncing.

Do not stand in front of a window while speaking. The light should be shining on your face and not the student's.

Try to rephrase a thought rather than saying the same words over again.

Encourage the student to read ahead on class material.

Try to keep the noise level down as much as possible in the class/laboratory.

Utilize handouts, the chalkboard, and other media.

Install a light to indicate when dangerous machinery is on.

Instructing Students Who Are Speech-Impaired

Always maintain eye contact and nod your head while the student is talking. This will help the student build confidence.

Work cooperatively with speech therapist and/or communication specialist to determine which technique will help most in assisting these students to communicate more effectively.

Encourage peer tutoring and small group activities to help the speech-impaired student develop interpersonal relationships with the other students.

Always allow sufficient time for the student to complete his/her sentence.

Try not to act uncomfortable when these individuals are communicating with you (i.e., discontinuing eye contact, shifting your position, clearing your throat). Your discomfort can be very discouraging to the student.

Do not require these individuals to present oral reports until they feel comfortable in the classroom environment.

Model correct sentence structure for the speech-impaired student so he/she can follow your example.

Develop a list of technical terms used in your class and share these terms with the speech specialist to help the student become more confident n pronouncing terms used in class.

Instructing Students Who are Visually Impaired

Orient the student to the classroom or laboratory before the course begins. Consistency and orderliness in the physical environment is very important to the visually impaired student.

Arrange seating so the blind student will be able to hear the instruction and to allow for the best distance and lighting conditions for the partially sighted student.

Provide as many opportunities as possible for the visually impaired student to observe closely or to touch the materials.

Give materials and handouts to the student ahead of time. Also, a student peer can assist visually impaired student by making a carbon copy or a photocopy of their notes. Also, when possible, the educator can make a copy of their teaching notes. In this way the visually impaired student can make a copy of their teaching notes. In this way the visually impaired student can review the materials with a tutor or have them transcribed in to braille or taped.

It is important to gain and maintain the student's attention. Approval or disapproval will need to be verbalized.

Remember there is no need to talk louder to a visually impaired student.

Rehabilitation counselors or special needs teachers can be useful resources in helping the student use commercial or modified learning aids or tools.

Tests may need to be prepared in large print, braille, on cassette tapes, or converted into exercises using the sense of touch. Also, it may be necessary to allow the student extra time to complete the test.

The tape recorder is the most frequently used technique for notetaking and preparing modified learning materials for the visually impaired student.

The following is a sample of specially designed machines now available for the visually impaired student: (a) OPTACON (Optical to Tacile Converter) allows students to read printed material, (b) STEREO-TONER is similar to the OPTACON but converts the printed word into a tone pattern, (c) OPTOPHONE and VISOTACTOR convert print into sound, and (d) KURZWEL READING MACHINE which converts standard English text on a computer into easily comprehended speech.

A number of general tools or aids which can assist the student in reading or writing lessons for vocational courses follow: (a) braille, (b) large print, (c) tape recorders, (d) talking books, (e) raised letters, (f) slate and stylus (used to make notes), (g) braille writer (a 6-key manually operated machine), (h) typewriters, (i) braille verifier (types braille and regular copy simultaneously), and (j) signature guides.

Aids for mathematics and computer programming courses follow: (a) abacus design for the blind, (b) raised clock faces, (c) wire geometrical forms, (d) braille rulers, (e) raised-line checkbooks, (f) raised-line boards, (g) braille dominoes, (h) braille flash cards, (i) cubes with raised braille dots used for simple mathematical problems, (j) raised-line paper or graphs, (k) computer terminals that use braille printers, or those that type braille and conventional type simultaneously, and (l) talking calculators.

Aids used frequently in other vocational courses include: (a) braille maps, charts, diagrams, (b) self-threading needles, (c) wooden or cardboard models of specimens that other students see through microscopes, (d) braille micrometers and other shop tools that have special raised markings, (e) braille demo tapes to mark lab equipment and models, (f) light probes with adible sounds that check the operating status of machines, and (g) guides or templates to help students align objects properly.

Instructing Students Who Are Seriously Emotionally Disturbed

Consult with the student's parents, special education teacher, or counselor to determine whether any particular teaching techniques will help or hinder learning.

Try to understand the student. Disturbing behaviors are the outward sign of inner turmoil.

Go easy on bad days and avoid direct confrontations that would aggravate the situation.

Communicate acceptance to the student and a willingness to help him or her succeed in class.

Provide immediate feedback and reinforcement.

Establishing a rapport and trust with the student is important.

In the beginning of the semester, help the student gain confidence by giving him or her lessons in which success can be achieved in a series of small steps.

A measure of privacy when the student attempts a new task can ease his or her embarrassment at any awkwardness or ineptness.

Allow the student to correct mistakes prior to turning in an assignment or project to ease any pressure.

Help the student not to overreact to failure and praise him or her for continuing to try.

Cue appropriate behavior in a quiet, unemotional manner.

In resolving discipline problems: (a) do so in privacy, (b) focus on objective facts in a calm, supportive tone, (c) actively listen to the student, (d) after listening to the student, reflect on what has been said, by telling the student what you've heard, (e) ask the student if he or she has any ideas about solving the problem (encourage the student to be specific), and (f) conclude with a clear understanding of the changes, time-frame, and benefits which are expected.

In handling aggressive behavior: (a) try to remain calm and model the controlled behavior which you desire, (b) intervene by either separating the individuals involved and having them work on another activity or having them take a time-out in separate corners of the room, (c) if necessary, send an uninvolved student to the office to get help, either in talking to the students or in managing the class while the teacher talks to them, and (d) return to normal classroom procedure as quickly as possible.

Access professional collegues in special education evaluation, counselling, or therapy when the student's behavior appears to be in need of additional attention.

Instructing Students Who Are Orthopedically Impaired

In general, students with physical handicaps will be intellectually capable and able to participate in vocational programs.

Make the necessary modifications in classrooms, laboratories, equipment, building accessibility, and lavatories.

For notetaking the student can: (a) use a tape recorder, (b) have a classmate slip a carbon copy into his/her notebook to duplicate notes, and/or (c) have the instructor prepare an outline of the lecture.

For exams the instructor can: (a) give oral exams, (b) have the student dictate answers into a tape recorder or to another student, or (c) utilize a typewriter/computer if the student is able to type/keyboard.

Give the student more time to complete homework assignments. Also, giving the student advance notification of assignments is helpful.

In the laboratory, pair the student with one or more capable students in the class.

Enlarge copies of frequently used charts and diagrams posted near the student's desk eliminates the necessity of paging through a book.

Instructing Students Who Are Other Health-Impaired

Allow the students sufficient time for rest.

Seat the student in the most convenient place for easy access to necessary facilities (hall, lavatory, chalkboard, laboratory work stations).

Allow the students to work on program requirements at his or her own pace.

Tape lectures so the student can listen to them at home.

Work cooperatively with the health team in order to learn more about the student's special needs.

Utilize community resources personnel (social workers and itinerant teachers for home-bound students) for delivery of materials, assignments, and handouts.

Instructing Students Who Have Specific Learning Disabilities

Use visuals and demonstrations as often as possible.

Use concrete examples whenever possible.

Provide student with an outline of what will be covered in class.

Make sure all printed materials are clear and readable.

If the student has a visual perception problem, allow him or her to tape-record assignments.

Allow students to take tests orally or in a mode that compliments their performance.

Present new information in small amounts.

Make sure that writing assignments are relevant to the content of the program.

Allow students a longer period of time to complete assignments, if necessary.

List assignments in steps.

Task analysis can be used to lower the frustration level of these learners.

Programmed instruction materials can be very effective with these learners.

The following is a list of specific teaching strategies which can be very useful when working with students who have **limited English proficiency** (Sarkees & Scott, 1985):

Recognize the student's cultural background and allow for the student's individual differences.

Encourage these students to bring dictionaries to class.

Use demonstrations and hands-on experience as much as possible.

Speak slowly and use simple vocabulary and grammar.

Use bright felt tip markers to mark important words, passages, or illustrations.

If possible, use a translator for important concepts.

Work closely with LEP support personnel.

Keep homework assignments short.

Check for comprehension by asking the student what you have said.

Use simple sentences when writing test items so the student can concentrate on answering the question rather than deciphering it.

And finally, with regard to the disadvantaged population, typically these individuals dislike school, lack motivation, and have a low self-concept or esteem. Therefore, an educator's personal commitment and high expectations for the student may be two of the biggest single factors which will make a positive difference in this individual's life. Additionally, an educator's good example (i.e., being patient, understanding, well organized, and a good manager) can be extremely valuable in motivating and positively shaping the student's behavior (Baca, 1981). Vocational education can offer a great deal to the disadvantaged student in terms of teaching academic and social skills relative to the student's potential employment (Baca, 1981). The following are additional techniques or teaching strategies which can be very useful when working with disadvantaged students (Baca, 1981):

The educator should seek to understand the student's educational and social background through: (a) assessment information, (b) interaction with former teachers, (c) discussions with counselors, and (d) visits with parents to ascertain the student's social limitations and home situation.

Basic math, communication, and social skills should be reinforced. Math skills can be reinforced through hands-on learning activities. Communication skills can be improved by tactfully correcting poor grammar, when appropriate, and by providing resources that encourage reading in job related interests. Social skills such as getting along with people, grooming, proper dress, and respect for property and authority should be reinforced on a continual basis.

The importance of finishing school should be continually stressed. Relate acquisition of job skills to earn income

Reinforce the student's feelings of self-worth by having high expectations for the student and by providing immediate reinforcement for work done well.

Simulate realistic job situations. All classroom and laboratory experiences should relate to employment in the occupation being studied.

Disadvantaged students (as all students) will typically react to the learning environment in a responsible and mature manner when they are treated with respect and as adults by the educator.

Classroom organization and discipline (being firm but not overbearing) are especially important. Generally, disadvantaged students want and need structure and discipline within their lives. Usually, these individuals will be responsive to and respect teachers who are firm, but sensitive.

Help the student develop employability and job coping skills (i.e., skills associated with finding, applying for, and retaining a job).

Help the student establish good work habits by keeping him or her involved with meaningful learning experiences. Each activity should have concrete learning objectives.

Disadvantaged students may need more encouragement to stay on task; however, they still should be required to complete all assignments (just as they will be required to do on the job).

Present instructions and information in clear, logical steps--building from the simple to the complex.

Technical terms should be communicated clearly and concisely and written in language which the students will understand.

Incorporate a variety of instructional methods in the curriculum (i.e., demonstrations, resource personnel, field trips, peer tutors, role playing, audio-visual aids, and on-site work experiences).

Present supplemental materials when appropriate. if such material is relevant to the acquisition of job skills, the student will not be humiliated by simplified material.

Highlight important parts of the student's text with a light marker to prevent the student from feeling overwhelmed with a larger volume of reading material.

Progress charts can be utilized to motivate disadvantaged students to master new skills.

Utilize flash cards (teacher made or commercial) to reinforce new terms and the use of tools and equipment.

When special needs students, it is very important that instructors do not limit their instructional techniques. Therefore, the following abstract of instructional techniques or strategies has been prepared which could be considered generic to all special needs populations.

Involve as many different senses as possible

Use concrete terms

Have students repeat important information

Use lists rather than paragraphs for written directions

Teach by demonstration

Use hand-over-hand assistance when necessary

Allow practice time

Break complex operations into smaller tasks

Provide immediate feedback

Build confidence

Help student make correct discriminations

Help student with their retention/memory

Help student generalize knowledge

Build rapport

Use appropriate body language

Use appropriate techniques when working with an interpreter

Maintain good eye contact

Speak slowly and clearly

Rephrase thoughts when necessary

Encourage the student to read ahead

Keep the noise level down

Utilize various forms of media

Use lights to indicate when dangerous machinery is on

Work cooperatively with therapists

Encourage peer tutoring

Try not to act uncomfortable around special needs students

Help students feel comfortable

Model correct sentence structure

Develop a list of technical terms for students and/or therapists

Orient students before the course begins

Provide handouts ahead of time

Maintain student's attention

Use tape recorders for note taking

Try to understand the student

Communicate acceptance

Develop success experiences for the student

Use appropriate behavioral management techniques

Facilitate the students with their notetaking

Facilitate the students with exams

Pair students

Enlarge charts and diagrams

Use clear readable visual frequently

Provide an outline of material which is being taught

Writing assignments should be relevant

Use task analysis when necessary

Allow for individual differences

Encourage students to bring a dictionary

Use felt tip marker to highlight important parts

Do not make homework assignments too lengthy

Use simple sentences when writing test items

Reinforce basic education and work skills

Reinforce the importance of finishing school

Reinforce the student's feelings of self-worth

Simulate realistic job situations

Treat all students with respect and dignity

Provide structure and organization

Utilize progress charts

Utilize flash cards

Remediation in the Basic Education Skills

It is very important to note that some students may need to acquire one or more basic education skills (i.e., mathematics, reading, writing, speaking, listening, interpersonal relations, and/or reasoning skills) to succeed in vocational program. In addition, many employers will not hire an individual if he or she lacks these skills. Therefore, instruction in basic education skills may be necessary by the vocational educator. For information concerning basic or generalized skills instruction see Module 8.

Brown's 3-C Model

Brown's 3-C Model helps tie together many of the educational aspects discussed in this Overview. In general, Brown suggests that when delivering instruction to learners with special needs, the instructor can enhance the student's success rate and reduce feelings of frustration by considering the following 3-Cs of instruction: (a) correction, (b) compensation, and (c) circumvention (Brown & Dayser, 1982):

Correction. Providing feedback when the student's skills are being developed, thereby, correcting inappropriate behaviors immediately after they appear. Employing remedial reading and math services to enhance the student's ability to function within the program.

Compensation. Helping the student realize that each task represents only one of many activities contained in the course and that weaknesses in one area can often be offset by strengths in other areas. It should be communicated to the student that some tasks are inherently difficult and that he/she should not expect to achieve success immediately. Further efforts to compensate for the student would be to modify or adjust the delivery of instruction to extend over segments of several class periods. In addition, reinforcement during the early stages of instruction should be amply provided.

Note: Basically, "compensation" involves the instructor's modifications to the curriculum, learning environment, and instruction which has been discussed in this Overview.

Circumvention. If the vocational program is a way out of reach for a student, for example, due to a course requirement of a relatively high level of reading skill, it may become necessary for the student to "circumvent" this difficulty by discussing alternate training programs with a vocational counselor.

Summary

Modification of curriculum, learning environment, and instruction can be an important key to successful employment training for special needs students. It requires that the instructor know his/her content completely, but the benefits to all students will likely be extraordinary.

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COMPLIANCE STATEMENT

TITLE VI, CIVIL RIGHTS ACT OF 1964; THE MODIFIED COURT ORDER, CIVIL ACTION 5281, FEDERAL DISTRICT COURT, EASTERN DISTRICT OF TEXAS, TYLER DIVISION

Reviews of local education agencies pertaining to compliance with Title VI Civil Rights Act of 1964 and with specific requirements of the Modified Court Order, Civil Action No. 5281, Federal District Court, Eastern District of Texas, Tyler Division are conducted periodically by staff representatives of the Texas Education Agency. These reviews cover at least the following policies and practices:

(1) acceptance policies on student transfers from other school districts;

(2) operation of school bus routes or runs on a non-segregated basis;

(3) nondiscrimination in extracurricular activities and the use of school facilities;

(4) nondiscriminatory practices in the hiring, assigning, promoting, paying, demoting, reassigning, or dismissing of faculty and staff members who work with children;

(5) enrollment and assignment of students without discrimination on the basis of race, color, or national origin;

(6) nondiscriminatory practices relating to the use of a student's first language; and

(7) evidence of published procedures for hearing complaints and grievances.

In addition to conducting reviews, the Texas Education Agency staff representatives check complaints of discrimination made by a citizen or citizens residing in a school district where it is alleged discriminatory practices have occurred or are occurring.

Where a violation of Title VI of the Civil Rights Act is found, the findings are reported to the Office for Civil Rights, Department of Health, Education and Welfare.

If there is a direct violation of the Court Order in Civil Action No. 5281 that cannot be cleared through negotiation, the sanctions required by the Court Order are applied.

TITLE VII, CIVIL RIGHTS ACT OF 1964; EXECUTIVE ORDERS 11246 AND 11375; TITLE IX, 1973 EDUCATION AMENDMENTS; REHABILITATION ACT OF 1973 AS AMENDED; 1974 AMENDMENTS TO THE WAGE-HOUR LAW EXPANDING THE AGE DISCRIMINATION IN EMPLOYMENT ACT OF 1967; AND VIETNAM ERA VETERANS READJUSTMENT ASSISTANCE ACT OF 1972 AS AMENDED IN 1974.

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Building Trades II

LESSON PLANS

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BUILDING TRADES II
LESSON PLANS

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PREFACE

The Educational Development and Training Center at East Texas State University is striving to provide needed materials to vocational instructors within the state.

The purpose of this publication is to assist instructors in improving instruction. As these materials are used, it is hoped that student performance will improve and students will be better prepared to assume a role in the field of building trades. This publication extends the *Building Trades I Lesson Plans.*

Instructional materials in this publication are written in terms of student performance, using measurable objectives. This approach augments the teacning-learning process. Criterion-referenced evaluation instructions are provided for uniform measurement of student progress. In addition to evaluating recall information, teachers are encouraged to evaluate the other areas, including progress and the finished product.

The instructor should, where appropriate, reinforce the application of basic academic skills. For example, when addressing the estimating construction costs area of study, the instructor should stress to students that they will be applying specific mathematical skills such as addition, subtraction, multiplication, and division that they have learned in previous academic courses. Effective teaching practices research, and consequently the Texas Teacher's Appraisal System emphasizes the relationship of new learning to prior or future learning. In some cases, specific academic skills needed to complete job tasks may not have yet been addressed in the academic courses in which the students have been enrolled. If this is the case, the vocational instructor should introduce and explain the academic skills, and students should achieve a level of mastery that will allow them to perform the job tasks. Instructors of vocational courses are encouraged to work closely with instructors of academic courses to ensure that students are taught fundamental academic principles correctly.

Every effort has been made to make this publication basic, readable, and by all means, usable. Three vital areas of instruction (motivation, personalization, and localization) are not included in this publication; however, they should be capitalized on by the instructor. Only then will this publication really become a vital part of the teaching-learning process.

COMMON ESSENTIAL ELEMENTS

75.88 Trade and Industrial Education

(a) The elements in this subsection are common to all trade and industrial courses unless otherwise indicated and shall be included in each course at the appropriate level. They are described here to preclude repetitions in each course. Every school offering trade and industrial education shall provide courses which include the following essential elements:

(1) Leadership concepts and skills. The student shall be provided opportunities to:

(A) demonstrate skills, characteristics, and responsibilities of leaders and effective group members;

(B) demonstrate a knowledge of parliamentary procedure principles;

(C) plan and conduct leadership activities; and

(D) prepare for effective citizenship and for participation in our democratic society.

(2) Concepts and skills related to successful employment and/or postsecondary training. The student shall be provided opportunities to:

(A) identify employment opportunities and preparation requirements in chosen fields;

(B) identify effective methods to secure and terminate employment;

(C) demonstrate effective communication skills both oral and written and follow through on assigned tasks;

(D) demonstrate dependability and punctuality;

(E) demonstrate productive work habits and attitudes;

(F) understand the importance of taking pride in the quality of work performed;

(G) recognize the dignity in work;

(H) develop skills in planning and organizing work;

(I) apply required methods and sequences when performing tasks;

(J) apply principles of time management and work simplification when performing assigned tasks;

(K) identify ethical practices and responsibilities; and

(L) understand the importance of the application of organizational policies and procedures.

(3) Concepts and skills associated with entrepreneurship. The student shall be provided opportunities to:

(A) identify opportunities for business ownership;

(B) understand the risk and profit motive factor;

(C) understand the elements and advantages of the free enterprise system; and

(D) explain the role of small business in the free enterprise system.

(4) Concepts and skills related to safety and safe working conditions. The student shall be provided opportunities to identify and apply safe working practices to all training situations.

(5) Concepts and skills associated with human relations and personality development. The student shall be provided opportunities to:

(A) understand the importance of maintaining good health and proper appearance for effective job performance;

(B) understand oneself and others;

(C) exercise self-control;

(D) accept and use criticism;

(E) recognize basic human relationships as they relate to business success; and

(F) demonstrate characteristics for successful working relationships.

(6) Concepts and skills related to personal and business management. The student shall be provided opportunities to:

(A) explain how management assists in reaching personal and family goals;

(B) explain the management process;

(C) describe the role of management in controlling stress;

(D) identify and understand personal checking accounts;

(E) identify and understand personal loan application processes;

(F) identify and understand different financial institutions;

(G) identify the role and function of business management;

(H) understand the lines of authority; and

(I) identify effective supervisory techniques.

(7) Concepts and skills associated with the specific occupation being taught. The student shall be provided opportunities to:

(A) understand the basic concepts of and develop proficiency in the occupational area for which instruction/training is provided;

(B) develop a fundamental understanding of mathematical principles and scientific procedures;

(C) understand terminology utilized;

(D) identify tools, equipment, and materials used; and

(E) develop and demonstrate appropriate techniques for the selection, use, maintenance, and storage of tools, equipment, and materials.

ESSENTIAL ELEMENTS FOR BUILDING TRADES II

(e) Building trades (two-three units) shall include the essential trade and industrial education elements and the following essential elements:

(1) Concepts and skills associated with residential carpentry. The student shall be provided opportunities to:

(A) read blueprints and work drawings;

(B) identify and estimate costs of various building materials;

(C) demonstrate appropriate concrete form setting techniques;

(D) understand concrete placement and finishing procedures;

(E) utilize appropriate framing techniques including walls, floors, ceilings, rafters, and trusses;

(F) install roof flashing and covering;

(G) understand and demonstrate proper techniques in door and window installation;

(H) identify and install various exterior and interior wallcovering and trim; and

(I) understand proper techniques in stair framing.

(2) Concepts and skills associated with bricklaying. The student shall be provided opportunities to understand construction processes utilized in the construction of stonewalls, foundation walls, repairing cracks, and blueprint reading.

(3) Concepts and skills associated with residential electrician. The student shall be provided opportunities to:

(A) understand schematic diagrams and symbols; and

(B) understand the installation of electric service, wiring, and fixtures.

(4) Concepts and skills associated with painting and decorating. The student shall be provided opportunities to understand the basic principle of drywall, interior, and exterior finishes.

(5) Concepts and skills associated with plumbing. The student shall be provided opportunities to understand the process and sequence of installing external and internal plumbing in residential construction.

REFERENCE: *Building Trades I*, Unit I

LESSON PLAN

CARPENTRY

UNIT:	Blueprints and Working Drawings
TOPIC:	Sectional Views
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(e)(1)(A)
TYPE OF LESSON:	Cognitive
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to read and interpret the sectional and detail parts of blueprints correctly.
TOOLS AND EQUIPMENT:	Overhead projector, pencil, fractional rule, calculator
MATERIALS:	8 1/2" x 11" poster board
TEACHING AIDS:	Chalkboard; samples of blueprints and working drawings
REFERENCES:	*Building Trades II* II-1-A-IS II-1-A-AS II-1-A-JS-1 II-1-A-JS-2 II-1-A-JS-3

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

By the end of this lesson, you will correctly use forms with units of measure symbols and interpret terminology used with blueprints and working drawings in building trades.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-1-A-IS as a guide, discuss symbols and sectional views used on blueprints and working drawings.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-2-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students locate symbols and details on blueprints and working drawings and explain their purpose to the class. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss information on sectional views and details.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Have students discuss why sectional views are enlarged.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-1-A-AS, II-1-A-JS-1, II-1-A-JS-2, and II-I-A-JS-3 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the various types of blueprints and working drawings used today.

THE NEXT LESSON IS: Sectional Views

LESSON PLAN

CARPENTRY

UNIT:	Blueprints and Working Drawings
TOPIC:	Sectional Views
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(c)(1)(A)
TYPE OF LESSON:	Cognitive; psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to read and interpret the sectional and detail parts of blueprints correctly.

TOOLS AND EQUIPMENT:	Overhead projector, pencil, fractional rule
MATERIALS:	8 1/2" x 11" paper
TEACHING AIDS:	Chalkboard, set of blueprints and working drawings; make transparencies of art work provided in the information sheets.
REFERENCES:	*Building Trades II* II-1-A-IS II-1-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

By the end of this lesson, you will read and interpret forms with units of measure, symbols, and terminology contained in blueprints and working drawings correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-1-A-JS-1 as a guide, discuss the importance of using sectional views at a work site.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-2-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students locate symbols and details on blueprints and working drawings which they can identify and discuss. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss information on sectional views and details.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Have students discuss why sectional views are enlarged.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-1-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the various types of blueprints and working drawings used today.

THE NEXT LESSON IS: **Sectional Views**

II-1-A-LP-2

LESSON PLAN

CARPENTRY

UNIT:	Blueprints and Working Drawings
TOPIC:	Sectional Views
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(e)(1)(A)
TYPE OF LESSON:	Cognitive
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to read and interpret the sectional and detail parts of blueprints correctly.

TOOLS AND EQUIPMENT:	Pencil, fractional rule
MATERIALS:	8 1/2" x 11" paper; detail blueprints available in back of student manual
TEACHING AIDS:	Chalkboard, set of blueprints and working drawings
REFERENCES:	*Building Trades II* II-1-A-IS II-1-A-JS-2

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

By the end of this lesson, you will read and interpret forms with units of measure, symbols, and terminology contained in blueprints and working drawings correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-1-A-JS-2 as a guide, discuss symbols and sectional views used on blueprints and working drawings.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-2-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students locate symbols and details on blueprints and working drawings which they can identify and discuss. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss information on sectional views and details.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss the information contained in the job sheet.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-1-A-JS-2 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the various types of blueprints and working drawings used today.

THE NEXT LESSON IS: Estimating Board Feet

LESSON PLAN

CARPENTRY

UNIT:	Blueprints and Working Drawings
TOPIC:	Estimating Board Feet
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(e)(1)(A)
TYPE OF LESSON:	Cognitive; Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to estimate board feet for a task correctly.

TOOLS AND EQUIPMENT:	Caculator, 12" scale, pencil
MATERIALS:	Attached sketch with job sheet, paper
TEACHING AIDS:	Chalkboard, blueprints
REFERENCES:	*Building Trades II* II-1-A-IS II-1-A-JS-3

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

The estimating and cost of material is very important; It can be the difference between a business that makes a profit or loses money on a job. After this lesson, you will be able to estimate material correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-1-A-JS-3 as a guide, discuss how estimates are made.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-2-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students do an estimate and explain to the class how it was done. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss procedures used to estimate materials.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Observe students and provide assistance as they complete the job sheet.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-1-A-JS-3 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and/or observing students as job sheets are completed.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding estimating the amount of board feet needed.

THE NEXT LESSON IS: Freehand sketching

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LESSON PLAN

CARPENTRY

UNIT:	Blueprints and Working Drawings
TOPIC:	Freehand Sketching
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(e)(1)(A)
TYPE OF LESSON:	Cognitive; psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to read, interpret, and develop freehand sketching correctly.

TOOLS AND EQUIPMENT:	Sharp pencil, fractional rule or architect's scale, calculator
MATERIALS:	Floor plan and cavity wall sketches from student manual, job sheet sketch, 8 1/2" x 11" (or larger) grid paper and plain paper
TEACHING AIDS:	Chalkboard, samples of blueprints and working drawings
REFERENCES:	*Building Trades II* II-1-B-IS II-1-B-AS II-1-B-JS-1 II-1-B-JS-2 II-1-B-JS-3

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Freehand sketches provide you with a written interpretation of the work to be completed at each job site. Freehand sketches are primarily used in remodeling jobs. After this lesson, you will be able to read and interpret freehand sketches.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-1-B-IS as a guide, discuss the use of freehand sketching compared to blueprints and working drawings.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-2-B-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students locate fixtures on blueprints and working drawings and explain why a freehand sketch would be needed. In addition, you may choose to use related magazines, books, pictures, complete software, videos, etc.

2. Discuss why a plumber would use a freehand sketch.

CHECK FOR KNOWLEDGE

RETEACH ACTIVITIES

EXTENSION ACTIVITIES

3. Discuss when this type drawing would be beneficial.

CHECK FOR KNOWLEDGE

RETEACH ACTIVITIES

EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-1-B-AS, II-1-B-JS-1, II-1-B-JS-2 and II-1-B-JS-3 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the various types of blueprints and working drawings used today and the purpose of freehand sketches.

THE NEXT LESSON IS: Freehand sketching

LESSON PLAN

CARPENTRY

UNIT:	Blueprints and Working Drawings
TOPIC:	Freehand Sketching
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(e)(1)(A)
TYPE OF LESSON:	Cognitive; Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to read, interpret, and develop freehand sketching correctly.

TOOLS AND EQUIPMENT:	Sharp pencil
MATERIALS:	Paper, floor plan in student manual
TEACHING AIDS:	Chalkboard, set of blueprints and working drawings
REFERENCES:	*Building Trades II* II-1-B-IS II-1-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Freehand sketching is done to show dimensions and work to be done that is not contained in most blueprints. After this lesson, you will be able to draw and understand freehand sketching.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-1-B-IS as a guide, discuss the use of freehand sketching and the importance of being accurate.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-2-B-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students review job sheet and discuss the use of a freehand sketch. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss why carpenters would make a sketch of a stairway.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-1-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding why different workers would use this type of drawing.

THE NEXT LESSON IS: Draw Wall Section

LESSON PLAN

CARPENTRY

UNIT:	Blueprints and Working Drawings
TOPIC:	Draw Wall Section
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(e)(1)(A)
TYPE OF LESSON:	Cognitive; psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to read, interpret, and develop freehand sketching correctly.

TOOLS AND EQUIPMENT:	Sharp pencil, fractional rule
MATERIALS:	8 1/2" x 11" (or larger) grid paper; sketch from back of student manual for brick cavity wall.
TEACHING AIDS:	Chalkboard, set of blueprints and working drawings
REFERENCES:	*Building Trades II* II-1-B-IS II-1-B-JS-2

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Wall sections are drawn to a larger scale to show the details of special work to be done. After this lesson, you will be able to draw and correctly use these sections of blueprints.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-1-B-JS-2 as a guide, discuss the use of freehand sketching and the importance of being accurate.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-2-B-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students explain why wall sections are drawn. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the use of sections used on blueprints.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-1-B-JS-2 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the purpose of freehand sketching.

THE NEXT LESSON IS: Measurements of Floor Plan

LESSON PLAN

CARPENTRY

UNIT:	Blueprints and Working Drawings
TOPIC:	Measurements of Floor Plan
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(c)(1)(A)
TYPE OF LESSON:	Cognitive; psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to measure a floor plan correctly.

TOOLS AND EQUIPMENT:	Architect's scale or 12" scale, calculator, pencil
MATERIALS:	Sketch with job sheet, paper
TEACHING AIDS:	Chalkboard, blueprints
REFERENCES:	*Building Trades II* II-1-B-IS II-1-B-JS-3

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Measuring a floor plan properly will help to determine the amount of material and the procedure used to estimate material needed. By the end of the lesson, you will be able to give contractors, subcontractors, or remodeling contractors the correct measurements of the project to be constructed.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-1-B-JS-3 as a guide, discuss the meaning of measurements.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-2-B-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students show, on the chalkboard, the procedures used to measure different floor plans. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the importance of making all the measurements correctly.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-1-B-JS-3 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and/or by observing students as job sheets are completed.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding procedures used to measure a floor plan and discuss with class.

THE NEXT LESSON IS: Slab Floors

LESSON PLAN
CARPENTRY

UNIT:	Floor Systems
TOPIC:	Slab Floors
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(e)(1)(E)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to lay reinforcement for slab floors and construct subfloors correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to lay reinforcement for slab floors correctly.

TOOLS AND EQUIPMENT:	Overhead projector, calculator, pencil
MATERIALS:	Paper, foundation blueprint
TEACHING AIDS:	Chalkboard; make transparencies of wall sections in back of student manual.
REFERENCES:	*Building Trades II* II-2-A-IS II-2-A-AS II-2-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

There are several different types of floors used in construction. After this lesson, you will be able to use the techniques to construct slab floors correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-2-A-IS as a guide, discuss why reinforcing is used in the slab floor.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-4-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students review materials and discuss reinforcement used in slab floors. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and review information.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-2-A-AS and II-2-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding any problems students may have concerning slab floors.

THE NEXT LESSON IS: Estimating Footings

LESSON PLAN

CARPENTRY

UNIT:	Floor Systems
TOPIC:	Estimating Footings
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(1)(G)
TYPE OF LESSON:	Cognitive
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to lay reinforcement for slab floors and construct subfloors correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to estimate concrete correctly.

TOOLS AND EQUIPMENT:	Calculator, pencil
MATERIALS:	Blueprint provided, paper
TEACHING AIDS:	Chalkboard; blueprints
REFERENCES:	*Building Trades II* II-2-A-IS II-2-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

A correct estimate is the factor that will determine the profitability of a firm. How close the estimate of labor and materials are compared to the finished cost is important. After this lesson, you will be familiar with estimating practices a building contractor, subcontractor, or a remodeling contractor may use.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-2-A-JS-1 as a guide, discuss the meaning of estimating.

CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-3-B-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students make a list of the types of cost for which the builder must provide estimates. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the importance of making estimates which are close to the actual cost.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss what happens if a contractor fails to make an accurate estimate.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-2-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the use of estimates in the building trades construction.

THE NEXT LESSON IS: Subfloor Systems

LESSON PLAN

CARPENTRY

UNIT:	Floor Systems
TOPIC:	Subfloor Systems
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(e)(1)(E)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to lay reinforcement for slab floors and construct subfloors correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to construct a tongue-and-groove subfloor correctly.

TOOLS AND EQUIPMENT:	Overhead projector, calculator, pencil, 12" scale, 25' steel tape, framing square, hammer, nail set, chalkline, power nailer, skill saw, handsaw, sawhorses, notched trowel, chaulking gun, carpenter's pencil, safety equipment
MATERIALS:	Floor plan blueprint, paper, nails, mastic, 15 lb. building paper, polyethylene film, 1" x 2" sleeper material, concrete nails
TEACHING AIDS:	Chalkboard, samples of blueprints and working drawings; make transparencies of artwork provided in the information sheets.
REFERENCES:	*Building Trades II* II-2-B-IS II-2-B-AS II-2-B-JS-1 II-2-B-JS-2

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

The subfloor serves several purposes. Have students analyze a subfloor system and state why a subfloor is necessary. In this lesson, you will learn to construct a subfloor system correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-2-B-IS as a guide, discuss the use of a diagonal subfloor.

    CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-5-G-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

    RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

    EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students illustrate different types of subfloors on the chalkboard. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the use of different types of floor systems.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Have students discuss questions they may have about the installation of floor systems.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-2-B-AS, II-2-B-JS-1, and II-2-B-JS-2 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding any problems students may have regarding diagonal subflooring.

THE NEXT LESSON IS: Estimating Subfloor Material

LESSON PLAN

CARPENTRY

UNIT:	Floor Systems
TOPIC:	Estimating Subfloor Material
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(1)(G)
TYPE OF LESSON:	Cognitive
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to lay reinforcement for slab floors and construct subfloors correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to estimate materials used for a subfloor correctly.

TOOLS AND EQUIPMENT:	Calculator, pencil, 12" scale
MATERIALS:	Blueprints, paper
TEACHING AIDS:	Chalkboard, blueprints
REFERENCES:	*Building Trades II* II-2-B-IS II-2-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Estimates may serve many different functions. After this lesson, you will understand the estimating practices a building contractor, subcontractor, or a remodeling contractor may use.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-2-B-JS-1 as a guide, discuss the relationship between the estimator and contractor.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-3-B-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students show the complete estimates for subflooring material cost. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the importance of knowing about construction procedures when providing an estimate.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss the importance of having a knowledge of materials when providing an estimate.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-2-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the importance of estimates in building trades.

THE NEXT LESSON IS: Install Strip Flooring Over Concrete Slab

LESSON PLAN

CARPENTRY

UNIT:	Floor Systems
TOPIC:	Install Strip Flooring over Concrete Slab
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(1)(G)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to lay reinforcement for slab floors and construct subfloors correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to lay strip flooring correctly.

TOOLS AND EQUIPMENT:	25 foot steel tape, framing square, hammer, nail set, chalkline, power nailer, skill saw, hand saw, sawhorses, notched trowel, chaulking gun, carpenter's pencil, safety equipment
MATERIALS:	Nails, mastic, 15 lb. building paper, polyethylene film, 1" x 2" sleeper material, concrete nails
TEACHING AIDS:	Chalkboard, blueprints
REFERENCES:	*Building Trades II* II-2-B-IS II-2-B-JS-2

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

In this lesson, you will learn about special subflooring and floor framing. After this lesson, you will be familiar with techniques used to install subfloors and special floor framing.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-2-B-JS-2 as a guide, discuss the purpose of strip flooring over concrete slab.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-5-G-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss the different types of floor systems. Use blueprints or make transparencies to show students. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss special types of floors a carpenter must be able to construct.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss techniques used to install second story flooring.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-2-B-JS-2 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding procedures to install different types of flooring.

THE NEXT LESSON IS: Plywood Subfloor

LESSON PLAN

CARPENTRY

UNIT:	Floor Systems
TOPIC:	Plywood Subfloor
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(e)(1)(E)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to lay reinforcement for slab floors and construct subfloors correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to construct a plywood subfloor system correctly.

TOOLS AND EQUIPMENT:	Hammer, 25′ measuring tape, framing square, skill saw, chalkline, sawhorses, safety equipment
MATERIALS:	Tongue & groove plywood, 8d nails
TEACHING AIDS:	Chalkboard; samples of blueprints and working drawings
REFERENCES:	*Building Trades II* II-2-C-IS II-2-C-AS II-2-C-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

You now understand the purpose of the subfloor system. In this lesson, you will be able to construct the plywood subfloor correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-2-C-IS as a guide, discuss information regarding subfloors.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-5-G-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students draw a sectional view of a subfloor from a set of blueprints. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and demonstrate the techniques used to lay a plywood subfloor.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss the techniques used to lay a diagonal subfloor.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-2-C-AS and II-2-C-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding any problems students may have with plywood subfloors.

THE NEXT LESSON IS: Tongue and Groove Subfloor

LESSON PLAN

CARPENTRY

UNIT:	Floor Systems
TOPIC:	Tongue and Groove Subfloor
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(c)(1)(G)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to lay reinforcement for slab floors and construct subfloors correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to construct a plywood subfloor correctly.

TOOLS AND EQUIPMENT:	Hammer, 25′ measuring tape, framing square, skill saw, chalkline, sawhorses, safety equipment
MATERIALS:	Tongue-&-groove plywood, 8d nails
TEACHING AIDS:	Chalkboard, blueprints
REFERENCES:	*Building Trades II* II-2-C-IS II-2-C-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

You have had the opportunity to learn about the installation of subfloors. After this lesson, you will have demonstrated the ability to install subflooring.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-2-C-JS-1 as a guide, review information about installing subflooring.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-5-G-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students demonstrate to the class and discuss how to install plywood tongue-and-groove subfloor. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Review procedures to lay tongue-and-groove subfloors.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Have students discuss any questions they may have about the installation of floor systems.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-2-C-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and/or by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding any problems students may have with plywood subfloors.

THE NEXT LESSON IS: Stairway Parts

LESSON PLAN

CARPENTRY

UNIT: Stairway Systems

TOPIC: Stairway Parts

ESSENTIAL ELEMENT(S): (a)(7)(A),(C);(e)(1)(I)

TYPE OF LESSON: Cognitive

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct stairway systems correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to identify and state the purpose of stairway parts correctly.

TOOLS AND EQUIPMENT: Calculator, 12" scale, 25′ measuring tape, pencil

MATERIALS: Blueprints, paper

TEACHING AIDS: Chalkboard; make transparencies of artwork provided in the information sheet.

REFERENCES: *Building Trades II*

II-3-A-IS
II-3-A-AS
II-3-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

In order to build a stairway, you must know the necessary parts. In this lesson, you will learn and be able to construct stairway parts correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-3-A-IS as a guide, discuss the use of stairway parts.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-6-B-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Show students art work from information sheets. Have students explain parts of the stairway. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and review the parts of a stairway.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Have students draw a detail using stairway blueprints .

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-3-A-AS and II-3-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the fundamental parts of a stairway.

THE NEXT LESSON IS: Estimating Materials for Stairs

LESSON PLAN

CARPENTRY

UNIT:	Stairway Systems
TOPIC:	Estimating Materials for Stairs
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(1)(G)
TYPE OF LESSON:	Cognitive
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct stairway systems correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to identify and state the purpose of stairway parts and their cost correctly.

TOOLS AND EQUIPMENT:	Calculator, 12" scale, 25′ measuring tape, pencil
MATERIALS:	Blueprints, paper
TEACHING AIDS:	Chalkboard; blueprint
REFERENCES:	*Building Trades II* II-3-A-IS II-3-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Estimating the material and cost of stairs is important. After this lesson, you will be familiar with procedures to estimate material and cost that contractors and subcontractors may use.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-3-A-JS-1 as a guide, discuss procedures to estimate material for stairs.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-3-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students make a list of materials and cost for stairs, and discuss procedures with class. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the importance of estimating material.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss why it is important to make a correct estimate.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-3-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the use of estimates in building trades.

THE NEXT LESSON IS: Open Stairway

LESSON PLAN

CARPENTRY

UNIT:	Stairway Systems
TOPIC:	Open Stairway
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(e)(1)(I)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct stairway systems correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to construct an open stairway correctly.

TOOLS AND EQUIPMENT:	Sharp pencil, fractional rule
MATERIALS:	11 1/2" x 20" graph paper, TM-1 stairway detail
TEACHING AIDS:	Chalkboard, set of blueprints and working drawings.
REFERENCES:	*Building Trades II* II-3-B-IS II-3-B-AS II-3-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Building a stairway can be very difficult, depending on the type. After this lesson, you will be able to construct an open stairway correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-3-B-IS as a guide, discuss the procedure used to construct an open stairway.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-6-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Demonstrate on the chalkboard an open stairway design, including appropriate parts. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the design for an open stairway.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss the fundamental parts of the stairway and terminology used in stairway construction.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-3-B-AS and II-3-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the fundamental parts of stairway construction.

THE NEXT LESSON IS: Drawing Open Stairway

LESSON PLAN

CARPENTRY

UNIT:	Stairway Systems
TOPIC:	Drawing Open Stairway
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(e)(1)(I)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct stairway systems correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to construct an open stairway correctly.

TOOLS AND EQUIPMENT:	Sharp pencil, fractional rule
MATERIALS:	11 1/2" x 20" graph paper, TM-1 stairway detail from student manual
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* II-3-B-IS II-3-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Building a stairway can be very difficult, depending on the type. By drawing these details, you will understand how different stairs are constructed. After this lesson, you will be able to construct an open stairway correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-3-B-JS-1 as a guide, review the procedure to draw an open stairway.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-6-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss and demonstrate procedure used to draw the design, including appropriate parts. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss procedures used when constructing an open stairway.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Observe students and provide assistance as they complete the job sheet.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-3-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the use of an open stairway and stairway construction.

THE NEXT LESSON IS: Stair Layout

LESSON PLAN

CARPENTRY

UNIT:	Stairway Systems
TOPIC:	Stair Layout
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(e)(1)(I)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct stairway systems correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to design a stair layout correctly.

TOOLS AND EQUIPMENT:	Framing square, 25′ tape measure, handsaw, sawhorses, stair gauge, metal clamps for framing square, skill saw
MATERIALS:	2" x 12" material as required
TEACHING AIDS:	Chalkboard; make transparencies using TM-3 from the information sheet.
REFERENCES:	*Building Trades II* II-3-C-IS II-3-C-AS II-3-C-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

You must know the proper design of a stair layout and the dimensions to use for a stairway. After completing the lesson, you will be able to design a stair layout correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-3-C-IS as a guide, discuss the design of a stair layout.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I,* III-6-B-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students make a sketch using blueprints to show a stairway layout. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss procedure for stair layout.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss why a carpenter should do a stair layout before construction.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-3-C-AS and II-3-C-JS-1as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding stairway layout design.

THE NEXT LESSON IS: Building an Open Stairway

LESSON PLAN

CARPENTRY

UNIT:	Stairway Systems
TOPIC:	Building An Open Stairway
ESSENTIAL ELEMENT(S):	(a)(7)(A),)(C),(D),(E);(e)(1)(G)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct stairway systems correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to construct an open stairway correctly.

TOOLS AND EQUIPMENT:	Framing square, 25' measuring tape, handsaw, sawhorses, stair gauge, metal clamps for framing square, skill saw, overhead projector
MATERIALS:	2" x 12" materials as required
TEACHING AIDS:	Chalkboard; blueprints, transparencies
REFERENCES:	*Building Trades II* II-3-C-IS II-3-C-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

You are fortunate to have the opportunity to study stairway framing. After this lesson, you will be able to construct an open stairway.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-3-C-JS-1 as a guide, review procedures used to construct an open stairway.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-6-B-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students demonstrate how an open stairway is constructed. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

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2. Discuss any problems student(s) may have completing job sheet.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss procedures used to finish stairs.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-3-C-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and/or by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding stairway construction and installation.

THE NEXT LESSON IS: Semihoused Stringers

LESSON PLAN

CARPENTRY

UNIT:	Stairway Systems
TOPIC:	Semihoused Stringers
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(e)(1)(I)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct stairway systems correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to construct the semihoused stringers correctly.

TOOLS AND EQUIPMENT:	25′ measuring tape, hammer
MATERIALS:	Disappearing stair kit from manufacturer
TEACHING AIDS:	Chalkboard, set of blueprints and working drawings; make transparencies from art work provided in the information sheet .
REFERENCES:	*Building Trades II* II-3-D-IS II-3-D-AS II-3-D-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

You have seen different types of stairways and parts. After this lesson, you will be able to construct a semihoused stringer correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-3-D-IS as a guide, discuss the procedure for constructing a semihoused stringer.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-2-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students study transparency and draw a detail of a semihoused stringer from TM-4. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss procedures and terminology used in stairway construction.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions or problems students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-3-D-AS and II-3-D-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding stairway construction and installation.

THE NEXT LESSON IS: Install Disappearing Stairs

LESSON PLAN

CARPENTRY

UNIT: Stairway Systems

TOPIC: *Install Disappearing Stairs*

ESSENTIAL ELEMENT(S): (a)(7)(A),(C);(e)(1)(I)

TYPE OF LESSON: Psychomotor

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct stairway systems correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to construct the disappearing stair system correctly.

TOOLS AND EQUIPMENT: Hammer, 25-foot steel tape measure

MATERIALS: Disappearing stair kit from manufacturer

TEACHING AIDS: Chalkboard, set of blueprints for stair construction

REFERENCES: *Building Trades II*
II-3-D-IS
II-3-D-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Another type of stairway is the disappearing stair which is primarily used in hallways and garages. After this lesson, you will be able to construct and install this type of stairway.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-3-D-JS-1 as a guide, review the procedure for stairway construction.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-6-B-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students state the advantages and disadvantages of disappearing stairs. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and demonstrate the procedures for completing the job sheet.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Observe students and provide assistance as they complete the job sheet.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-3-D-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding installation of different stairways.

THE NEXT LESSON IS: Story Pole

LESSON PLAN

CARPENTRY

UNIT: Wall Systems

TOPIC: Story Pole

ESSENTIAL ELEMENT(S): (a)(7)(A),(C);(c)(1)(E)

TYPE OF LESSON: Psychomotor

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct bearing partitions, nonbearing partitions, and metal frames correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to use a story pole for measurements to construct a wall system correctly.

TOOLS AND EQUIPMENT: Marking pencil, 25′ steel tape measure, speed square, blueprint of wall section provided by instructor

MATERIALS: Straight 2" x 4" x 10′ board

TEACHING AIDS: Chalkboard; make transparencies from art work provided in information sheet.

REFERENCES: *Building Trades II*

II-4-A-IS
II-4-A-AS
II-4-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

This story pole measuring procedure is very accurate and saves time. After this lesson, you will be able to lay out the dimensions from blueprints onto a story pole.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-4-A-IS as a guide, discuss the process of laying out a story pole.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students use a set of blueprints to determine the dimensions to be used on a story pole. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and demonstrate procedures to lay out a story pole.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss and review transparencies on laying out the story pole.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-4-A-AS and II-4-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the story pole layout.

THE NEXT LESSON IS: Making a Story Pole

LESSON PLAN

CARPENTRY

UNIT:	Wall Systems
TOPIC:	Making a Story Pole
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(c)(1)(E)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct bearing partitions, nonbearing partitions, and metal frames correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to use a story pole for measurements to construct a wall system correctly.

TOOLS AND EQUIPMENT:	Marking pencil, 25-foot steel tape measure, speed square, blueprint of wall section furnished by instructor
MATERIALS:	Straight 2" x 4" x 10' board
TEACHING AIDS:	Chalkboard; make transparencies of art provided in the information sheet.
REFERENCES:	*Building Trades II* II-4-A-IS II-4-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

In this lesson, you will have an opportunity to make a measurement guide to help in the construction process of a project.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-4-A-JS as a guide, review information sheet.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I.* Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students study transparencies and information sheet for story pole layout. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and demonstrate the procedures for making a story pole .

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss the dimensions that are used for the construction of story poles.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-4-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the layout of a story pole.

THE NEXT LESSON IS: Bearing Partition

LESSON PLAN

CARPENTRY

UNIT:	Wall Systems
TOPIC:	Bearing Partition
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(e)(1)(E)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct bearing partitions, nonbearing partitions, and metal frames correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to construct the bearing partition correctly.

TOOLS AND EQUIPMENT:	Hammer, 25′ tape measure, chalkline, framing square, skill saw, speed square, power extension cord, nail apron, 2′ level, carpenter's pencil, blueprints
MATERIALS:	2" x 4" x 14′ or 2" x 4" x 20′ utility framing lumber, 12d or 16d common nails
TEACHING AIDS:	Chalkboard, set of blueprints and working drawings. .
REFERENCES:	*Building Trades II* II-4-B-IS II-4-B-AS II-4-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

You have had the opportunity to study techniques and procedures used in wall assembly. By the end of the lesson, you will understand how to build a bearing partition.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-4-B-IS as a guide, discuss bearing partitions.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-7-D-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students review blueprints and drawings of wall systems. Have them sketch a bearing partition design. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss steps in framing a wall.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss and review the different aspects of wall assemblies.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-4-B-AS and II-4-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding problems that could occur while framing walls.

THE NEXT LESSON IS: Framing Bearing Partitions

LESSON PLAN
CARPENTRY

UNIT:	Wall Systems
TOPIC:	Framing Bearing Partitions
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(1)(G)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct bearing partitions, nonbearing partitions, and metal frames correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to construct the bearing partition correctly.

TOOLS AND EQUIPMENT:	Hammer, 25′ tape measure, chalkline, framing square, skill saw, speed square, power extension cord, nail apron, 2′ level, carpenter's pencil, blueprint
MATERIALS:	2" x 4" x 16′ or 2" x 4" x 20′ utility framing lumber, 12d or 16d common nails
TEACHING AIDS:	Chalkboard, blueprints
REFERENCES:	*Building Trades II* II-4-B-IS II-4-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

You have had the opportunity to study techniques and procedures used in wall assembly. After this lesson, you will be able to construct a bearing partition.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-4-B-JS-1 as a guide, review material and procedures used for constructing a bearing partition.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-7-D-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students review and discuss blueprints and drawings used to construct walls. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss layout procedures for walls

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss techniques used to plumb a bearing partition.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-4-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and/or by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding problems that could occur while framing walls.

THE NEXT LESSON IS: Nonbearing Partitions

LESSON PLAN

CARPENTRY

UNIT:	Wall Systems
TOPIC:	Nonbearing Partitions
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(e)(1)(E)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct bearing partitions, nonbearing partitions, and metal frames correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to construct a nonbearing partition correctly.

TOOLS AND EQUIPMENT:	Chalkline, plumb bob, framing square, skill saw, speed square, power extension cord, sawhorses, 4′ level, carpenter's pencil, 3" hole saw
MATERIALS:	3" stack pipe, 2" x 4" x 16′ or 2" x 4" x 16′ lumber, 12d or 16d common nails
TEACHING AIDS:	Chalkboard, set of blueprints and working drawings
REFERENCES:	*Building Trades II* II-4-C-IS II-4-C-AS II-4-C-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

After studying the techniques and procedures for constructing wall systems, you will be able to construct the nonbearing-type walls shown on blueprints and working drawings.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-4-C-IS as a guide, review techniques used in building wall systems.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-7-D-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students review blueprints and working drawings. Have students sketch or design nonbearing partitions. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and review wall sections found on blueprints and working drawings.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss preassembled wall construction.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-4-C-AS and II-4-C-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the use of nonbearing walls in construction.

THE NEXT LESSON IS: Frame a Stack Wall

LESSON PLAN

CARPENTRY

UNIT:	Wall Systems
TOPIC:	Frame A Stack Wall
ESSENTIAL ELEMENT(S).	(a)(7)(A),(C),(D),(E);(c)(1)(G)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct bearing partitions, nonbearing partitions, and metal frames correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to construct a nonbearing partition correctly.

TOOLS AND EQUIPMENT:	Chalkline, plumb bob, framing square, skill saw, speed square, power extension cord, sawhorses, 4′ level, carpenter's pencil, 3" hole saw
MATERIALS:	3" stack pipe, 2" x 4" x 16′ or 2" x 6" x 16′ lumber, 12d or 16d common nails
TEACHING AIDS:	Chalkboard, blueprint
REFERENCES:	*Building Trades II* II-4-C-IS II-4-C-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

After studying the techniques and procedures for constructing wall systems, you will be able to construct a stack or nonbearing wall.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-4-C-JS-1 as a guide, review techniques used in building wall systems.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-7-D-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students review blueprints and identify and discuss wall framing techniques. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Review wall sections shown on working drawings.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss preassembled wall construction.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-4-C-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and/or by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the use of nonbearing walls in construction.

THE NEXT LESSON IS: Metal Framing

LESSON PLAN

CARPENTRY

UNIT:	Wall Systems
TOPIC:	Metal Framing
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(e)(1)(E)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct bearing partitions, nonbearing partitions, and metal frames correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to construct metal framing correctly.

TOOLS AND EQUIPMENT:	Hammer, 25′ steel tape, framing square, nails, sawhorses
MATERIALS:	Metal channel molding, nails, 12" x 24" units, mineral fiber siding, blueprints or area furnished by instructor
TEACHING AIDS:	Chalkboard; make transparencies of art work provided in the information sheet.
REFERENCES:	*Building Trades II* II-4-D-IS II-4-D-AS II-4-D-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

After studying wall systems and the use of metal framing, you will be able to use metal framing correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-4-D-IS as a guide, review materials used in metal framing.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I.* Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students review transparencies and blueprints for wall construction. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Review transparencies and discuss metal frame parts.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss how wiring and plumbing are installed in metal framing.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-4-D-AS and II-4-D-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the assembly and use of metal framing.

THE NEXT LESSON IS: Applying Metal Channel Molding and Fiber Siding

LESSON PLAN

CARPENTRY

UNIT:	Wall Systems
TOPIC:	Applying Metal Channel Molding and Fiber Siding
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(E)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct bearing partitions, nonbearing partitions, and metal frames correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to install metal channel molding and fiber siding correctly.

TOOLS AND EQUIPMENT:	Hammer, 25′ steel tape, framing square, nails, sawhorses
MATERIALS:	Metal channel molding, nails, 12" x 24" units mineral fiber siding, blueprint or area furnished by instructor
TEACHING AIDS:	Chalkboard, blueprints
REFERENCES:	*Building Trades II* II-4-D-IS II-4-D-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

After studying wall systems and the use of metal framing, you will be able to use metal framing correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-4-D-JS-1 as a guide, review materials used in metal framing.

CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I.* Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss the procedures used in metal framing. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss procedures required for completing job sheets.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss how siding is installed using metal framing.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-4-D-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the use of metal framing for siding and walls.

THE NEXT LESSON IS: Sliding Glass Doors

LESSON PLAN

CARPENTRY

UNIT:	Door and Window Installation
TOPIC:	Sliding Glass Doors
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(1)(G)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install sliding glass doors, pocket doors, and windows correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to install sliding glass doors correctly.

TOOLS AND EQUIPMENT:	Carpenter's level, screwdriver, hammer, caulk, caulk gun
MATERIALS:	Use materials per manufacture's instructions.
TEACHING AIDS:	Chalkboard, set of blueprints and working drawings
REFERENCES:	*Building Trades II* II-5-A-IS II-5-A-AS II-5-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Builders do not have to make the doors on the job site. Most doors can be ordered preassembled. After this lesson, the student(s) will apply skills necessary to install preassembled sliding glass doors correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-5-A-IS as a guide, discuss and review information on and use of factory-made doors and windows.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students review blueprints and information on door installation. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss different designs of prebuilt doors.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss and demonstrate the installation of prebuilt doors.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-5-A-AS and II-5-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the installation and use of a sliding glass door.

THE NEXT LESSON IS: Installing the Sliding Door

LESSON PLAN

CARPENTRY

UNIT:	Door and Window Installation
TOPIC:	Installing the Sliding Door
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(1)(G)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install sliding glass doors, pocket doors, and windows correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to install sliding glass doors correctly.

TOOLS AND EQUIPMENT:	Carpenter's level, screwdriver, hammer, caulk, and caulk gun
MATERIALS:	Use materials per manufacturer's instructions
TEACHING AIDS:	Chalkboard, set of blueprints and working drawings
REFERENCES:	*Building Trades II* II-5-A-IS II-5-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Before installing door and window units, you should understand the procedures used to install doors and windows. At the end of this lesson, you will be able to install doors and windows correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-5-A-JS-1 as a guide, discuss procedures used to install prebuilt door units.

CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-9-B-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students demonstrate to the class procedures used to install doors and windows. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss procedures on the job site.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss questions students may have and/or assist them while they complete the job sheet.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-5-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the procedures for installing prehung doors.

THE NEXT LESSON IS: Pocket Doors

LESSON PLAN

CARPENTRY

UNIT:	Door and Window Installation
TOPIC:	Pocket Doors
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(1)(G)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install sliding glass doors, pocket doors, and windows correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to install pocket doors correctly.

TOOLS AND EQUIPMENT:	Screwdriver, folding rule, hammer, plumb bob, small wrench, and level
MATERIALS:	Hardware is included with bifold door units
TEACHING AIDS:	Chalkboard; make transparencies from art provided in the information sheet.
REFERENCES:	*Building Trades II* II-5-B-IS II-5-B-AS II-5-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

After completing this lesson, you will understand how to use blueprints and working drawings, and will be familiar with the terminology used to install pocket doors.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-5-B-IS as a guide, review and discuss the pocket door transparencies.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students review the transparencies depicting the procedures used to install pocket doors. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the design of pocket doors.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Answer questions students may have about installation and use of pocket doors.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-5-B-AS and II-5-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding any problems the students may have encountered.

THE NEXT LESSON IS: Install Bifold Door

LESSON PLAN

CARPENTRY

UNIT: Door and Window Installation

TOPIC: Install Bifold Doors

ESSENTIAL ELEMENT(S): (a)(7)(A),(C),(D),(E);(e)(1)(G)

TYPE OF LESSON: Psychomotor

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install sliding glass doors, pocket doors, and windows correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to install a bifold door correctly.

TOOLS AND EQUIPMENT: Screwdriver, folding rule, hammer, plumb bob, small wrench, and level.

MATERIALS: Hardware is included with bifold door unit.

TEACHING AIDS: Chalkboard, set of blueprints and working drawings

REFERENCES: *Building Trades II*
II-5-B-IS
II-5-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Before installing door units, you should understand the installation procedures. At the end of this lesson, you will install bifold doors correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-5-B-JS-1 as a guide, review information regarding the procedures used to install bifold doors.

CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students study transparencies from information sheet to be able to correctly install prebuilt door units. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and demonstrate the installation of prebuilt bifold doors.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Monitor students as they install bifold doors.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-5-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the installation of bifold doors.

THE NEXT LESSON IS: Window Installation

LESSON PLAN

CARPENTRY

UNIT: Door and Window Installation

TOPIC: Window Installation

ESSENTIAL ELEMENT(S): (a)(7)(A),(C),(D),(E);(e)(1)(G)

TYPE OF LESSON: Psychomotor

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install sliding glass doors, pocket doors, and windows correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to install windows correctly.

TOOLS AND EQUIPMENT: Hammer, saw, roofing knife, metal shears, chalk, screwdrivers, putty knife, wood chisel, framing square, level nails, 25′ tape measure

MATERIALS: Materials packaged with skylight, roofing cement complete window unit, material to shim sides, blueprint

TEACHING AIDS: Chalkboard, set of blueprints and working drawings.

REFERENCES: *Building Trades II*
II-5-C-IS
II-5-C-AS
II-5-C-JS-1
II-5-C-JS-2

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Before installing window units, you should have a working knowledge of installation procedures. After this lesson, you will be able to install windows correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-5-C-IS as a guide, review information for window installation.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-9-B-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students list the steps for installing windows. Then, have students prepare an Information Sheet to be used by their classmates. Using only the Information Sheets provided, determine if adequate instructions regarding the procedures were given. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and demonstrate procedures to install windows.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any problems students may have with window installation.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-5-C-AS, II-5-C-JS-1, and II-5-C-JS-2 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the correct installation of window units.

THE NEXT LESSON IS: Install Skylight

LESSON PLAN

CARPENTRY

UNIT:	Door and Window Installation
TOPIC:	Install Skylight
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(c)(1)(G)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install sliding glass doors, pocket doors, and windows correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to install a skylight correctly.

TOOLS AND EQUIPMENT:	Hammer, saw, roofing knife, metal shears, chalk, screwdrivers, putty knife
MATERIALS:	Materials packaged with skylight, roofing cement
TEACHING AIDS:	Chalkboard, blueprints and working drawings
REFERENCES:	*Building Trades II* II-5-C-IS II-5-C-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

You have had the opportunity to learn about door and window installation. By the end of this lesson, you will be able to install skylights correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-5-C-JS-1 as a guide, review information on correct skylight installation.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-9-B-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss why they believe skylights are becoming more popular. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and demonstrate the correct procedures used to install skylight units.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Monitor students as they complete the job sheet .

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-5-C-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the correct installation of skylights.

THE NEXT LESSON IS: Hanging Window Unit

LESSON PLAN

CARPENTRY

UNIT:	Door and Window Installation
TOPIC:	Hanging A Window Unit
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(1)(G)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install sliding glass doors, pocket doors, and windows correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to install a window unit correctly.

TOOLS AND EQUIPMENT:	Hammer, wood chisel, framing square, level, 10d or 12d nails, 25′ tape measure
MATERIALS:	Complete window unit, material to shim sides, blueprint
TEACHING AIDS:	Chalkboard, blueprints
REFERENCES:	*Building Trades II* II-5-C-IS II-5-C-JS-2

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

You have had the opportunity to learn about door and window installation. After this lesson, you will be able to install a window unit correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-5-C-JS-2 as a guide, review information on correct window installation.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-9-B-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss procedures to install window untis. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Monitor students as they complete the job sheets.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions or problems students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-5-C-JS-2 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the installation of different type windows and window units.

THE NEXT LESSON IS: Moisture-Resistant Wallboard

II-6-A-LP

LESSON PLAN

CARPENTRY

UNIT:	Interior Finish
TOPIC:	Moisture-Resistant Wallboard
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(e)(1)(H)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install moisture-resistant wallboard, light fixtures, and floor coverings, and construct bookcases and room dividers correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to install moisture-resistant wallboard correctly.

TOOLS AND EQUIPMENT:	Overhead projector, hammer, utility knife, handsaw, 25′ steel tape, 4′ level, 1/4" thick spacers, sawhorses, screwdriver
MATERIALS:	1 pint can of water-resistant wallboard sealer, brush, noncorrosive nails or screws, blueprint
TEACHING AIDS:	Chalkboard, set of blueprints and working drawings, (make transparencies from art work provided in information sheet)
REFERENCES:	*Building Trades II* II-6-A-IS II-6-A-AS II-6-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

After studying the methods and reasons for using this type wallboard, you will be able to install moisture-resistant wallboard correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-6-A-IS as a guide, review information regarding the procedure for installing moisture-resistant wallboards.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I.* Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss reasons why moisture-resistant wallboard is needed. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and demonstrate wallboard installation procedures.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-6-A-AS and II-6-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding procedures to install moisture-resistant wallboards correctly.

THE NEXT LESSON IS: Installing Moisture Resistant Wallboard

LESSON PLAN
CARPENTRY

UNIT:	Interior Finish
TOPIC:	Installing Moisture-Resistant Wallboard
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(1)(H)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install moisture-resistant wallboard, light fixtures, and floor coverings, and construct bookcases and room dividers correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to install moisture-resistant wallboard correctly.

TOOLS AND EQUIPMENT:	Hammer, utility knife, handsaw, 25′ steel tape, 4′ level, 1/4" thick spacers, sawhorses, screwdriver
MATERIALS:	1 pint can of water-resistant wallboard sealer, brush, noncorrosive nails or screws, blueprint
TEACHING AIDS:	Chalkboard, blueprints, transparencies
REFERENCES:	*Building Trades II* II-6-A-IS II-6-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

After studying the methods and reasons for using this type wallboard, you will be able to install moisture-resistant wallboard correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-6-A-JS-1 as a guide, review procedures on the job sheet.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I.* Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students use blueprints and discuss how water-resistant wallboard is installed, and in what areas. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and demonstrate the procedures to install moisture-resistant wallboard correctly.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Monitor students as they complete the job sheet.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-6-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding procedures to install moisture-resistant wallboard correctly.

THE NEXT LESSON IS: Bookcase

LESSON PLAN
CARPENTRY

UNIT:	Interior Finish
TOPIC:	Bookcase
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(e)(1)(H)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install moisture-resistant wallboard, light fixtures, and floor coverings, and construct bookcases and room dividers correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to construct a bookcase correctly.

TOOLS AND EQUIPMENT:	Hammer, 1 lb. of 8d finish nails, saw, 25′ tape measure, speed square
MATERIALS:	1 - 1" x 12" x length of closet, 2 - 1" x 12" x 6′, 1 - 1" x 12" x 8′ selves, 1" x 2" x length of closet, 2 - 1" x 2" x 12", 2-L brackets
TEACHING AIDS:	Chalkboard, set of blueprints and working drawings
REFERENCES:	*Building Trades II* II-6-B-IS II-6-B-AS II-6-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

After studying about interior finishes and bookcases, you will be able to understand the correct procedures for installing bookcases.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-6-B-IS as a guide, review information presented on interior finish.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss procedures for installing a bookcase. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and demonstrate procedures for installing a bookcase.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any problems students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-6-B-AS and II-6-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the procedures and installation of a bookcase.

THE NEXT LESSON IS: Rod and Shelf Installation

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LESSON PLAN

CARPENTRY

UNIT:	Interior Finish
TOPIC:	Rod and Shelf Installation
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(e)(1)(H)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install moisture-resistant wallboard, light fixtures, and floor coverings, and construct bookcases and room dividers correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to execute rod and shelf installation correctly.

TOOLS AND EQUIPMENT:	Hammer, 1 lb. of 8d finish nails, saw, 25' tape measure, speed square
MATERIALS:	1 - 1" x 12" x length of closet, 2 - 1" x 12" x 6', 1 - 1" x 12" x 8' shelves, 1" x 2" x length of closet, 2 - 1" x 2" x 12", 2-L brackets
TEACHING AIDS:	Chalkboard, drawing provided with job sheet
REFERENCES:	*Building Trades II* II-6-B-IS II-6-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Installing rods and shelves is not as simple as it might appear. After this lesson, you will be able to install rods and shelves correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-6-B-JS-1 as a guide, review information presented.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I.* Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss different uses of rods and shelves. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss rod and shelf installation procedures.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Disscuss any questions students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-6-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the use and installation of shelving.

THE NEXT LESSON IS: Floor Covering

II-6-C-LP

LESSON PLAN

CARPENTRY

UNIT:	Interior Finish
TOPIC:	Floor Covering
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(e)(1)(H)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install moisture-resistant wallboard, light fixtures, and floor coverings, and construct bookcases and room dividers correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to install floor coverings correctly.

TOOLS AND EQUIPMENT:	Hammer, carpet hook knife, 25′ steel tape, knee kicker, awls, chalkline, staple gun, power stretcher
MATERIALS:	Carpet, tack strip, padding
TEACHING AIDS:	Chalkboard; make transparencies from art in the information sheet.
REFERENCES:	*Building Trades II* II-6-C-IS II-6-C-AS II-6-C-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Many types of floor coverings are used as wearing surfaces over concrete slabs and wood subfloors. After this lesson, you will be able to install floor covering correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-6-C-IS as a guide, discuss the uses and installation of floor covering.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I,* III-10-I-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss how carpet is made and its uses. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss procedures for laying floor covering.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss questions or problems students may have about floor covering.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-6-C-AS and II-6-C-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding different types and installation of floor covering.

THE NEXT LESSON IS: Install Floor Covering

LESSON PLAN

CARPENTRY

UNIT:	Interior Finish
TOPIC:	Install Floor Covering
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(1)(H)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install moisture-resistant wallboard, light fixtures, and floor coverings, and construct bookcases and room dividers correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to install floor covering correctly.

TOOLS AND EQUIPMENT:	Hammer, carpet hook knife, 25′ steel tape, knee kicker, awls, chalkline, staple gun, power stretcher
MATERIALS:	Carpet, tack strip, padding
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* II-6-C-IS II-6-C-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Many types of floor coverings are used as wearing surfaces over concrete slabs and wood subfloors. After this lesson, you will be able to install floor covering correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-6-C-JS-1 as a guide, discuss procedures for laying floor covering.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-10-I-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss the different types of carpet and how they are installed. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

. Discuss the characteristics of carpet.

CHECK FOR KNOWLEDGE

RETEACH ACTIVITIES

EXTENSION ACTIVITIES

3. Discuss questions or problems students may have.

CHECK FOR KNOWLEDGE

RETEACH ACTIVITIES

EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-6-C-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding different types and installation of floor covering.

THE NEXT LESSON IS: Room Dividers

LESSON PLAN

CARPENTRY

UNIT: Interior Finish

TOPIC: Room Dividers

ESSENTIAL ELEMENT(S): (a)(7)(A),(C);(e)(1)(H)

TYPE OF LESSON: Psychomotor

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install moisture-resistant wallboard, light fixtures, and floor coverings, and construct bookcases and room dividers correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to construct room dividers correctly.

TOOLS AND EQUIPMENT: Power saw, hammer, jig saw, 25′ tape measure, square, chalkline

MATERIALS:

1 - 2" x 4" x 8′
1 - 2" x 10" x 9′
5 - 2" x 4" x 46 1/4"
1 - 1" x 8′ cover mold
5 - 1/2" basemold

2 sheets paneling
1 sheet lattice panel
1 lb. 10d common nails
1/4 lb. No. 4 finishing nails
sawhorses

TEACHING AIDS: Chalkboard; make transparencies from art in information sheet.

REFERENCES: *Building Trades II*
II-6-D-IS
II-6-D-AS
II-6-D-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

There are many different types of room dividers, depending on available space to be used. After this lesson, you will be able to construct a room divider correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-6-D-IS as a guide, discuss information on room dividers provided.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I.* Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students draw and design a room divider, label dimensions to be used, and discuss the use for the wall in class. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the reason(s) for using a divider wall.

CHECK FOR KNOWLEDGE

RETEACH ACTIVITIES

EXTENSION ACTIVITIES

3. Discuss procedures used to construct a divider wall.

CHECK FOR KNOWLEDGE

RETEACH ACTIVITIES

EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-6-D-AS and II-6-D-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the layout and use of the divider wall.

THE NEXT LESSON IS: Building A Divider Wall

LESSON PLAN
CARPENTRY

UNIT: Interior Finish

TOPIC: Building A Divider Wall

ESSENTIAL ELEMENT(S): (a)(7)(A),(C);(c)(1)(H)

TYPE OF LESSON: Psychomotor

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install moisture-resistant wallboard, light fixtures, and floor coverings, and construct bookcases and room dividers correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to construct room dividers correctly.

TOOLS AND EQUIPMENT: Power saw, hammer, jig saw, 25′ tape measure, square, chalkline

MATERIALS:

1 - 2" x 4" x 8′
1 - 2" x 10" x 9′
5 - 2" x 4" x 46 1/4"
1 - 1" x 8′ corner mold
5 - 1/2 basemold
2 sheets paneling
1 sheet lattice panel
1 lb. 10d common nails
1/4 lb. No. 4 finishing nails
sawhorses

TEACHING AIDS: Chalkboard

REFERENCES: *Building Trades II*
II-6-D-IS
II-6-D-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Divider walls are made to satisfy individual customers' needs, and can be constructed accordingly. After completing this lesson, you will be able to construct a divider wall correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-6-D-JS-1 as a guide, discuss the procedures for constructing a divider wall.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students draw and design a divider wall, label dimensions to be used, and discuss the use for the wall in class. In addition, you may

2. Discuss different types of divider walls and materials used to make them.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions or problems students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-6-D-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the size, material, and design of a divider wall.

THE NEXT LESSON IS: Lighting

LESSON PLAN

CARPENTRY

UNIT:	Interior Finish
TOPIC:	Lighting
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(e)(1)(H)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install moisture-resistant wallboard, light fixtures, and floor coverings, and construct bookcases and room dividers correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to install lighting fixtures correctly.

TOOLS AND EQUIPMENT:	Wire cutters, knife, thin bladed screwdriver, flashlight
MATERIALS:	Single-pole dimmer switch, wire caps
TEACHING AIDS:	Chalkboard; make transparencies from art in information sheet.
REFERENCES:	*Building Trades II* II-6-E-IS II-6-E-AS II-6-E-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

There are many types of light fixtures and, correspondingly, many ways to install them. After this lesson, you will be able to install lighting fixtures.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-6-E-IS as a guide, discuss information on lighting provided.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I.* Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students identify and discuss the different types of lighting fixtures. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss how light tracking is installed.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions or problems students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-6-E-AS and II-6-E-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the installation of lighting fixtures.

THE NEXT LESSON IS: Installing a Dimmer Switch

LESSON PLAN

CARPENTRY

UNIT:	Interior Finish
TOPIC:	Installing a Dimmer Switch
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(e)(1)(H)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install moisture-resistant wallboard, light fixtures, and floor coverings, and construct bookcases and room dividers correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to install a dimmer switch correctly.

TOOLS AND EQUIPMENT:	Wire cutters, knife, thin-bladed screwdriver, flashlight
MATERIALS:	Single-pole dimmer switch, wire caps (if switch comes with wires)
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* II-6-E-IS II-6-E-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Dimmer switches can be used to dim lights for mood lighting or for ceiling fans. After completing this lesson, you will be able to install a dimmer switch correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-6-E-JS-1 as a guide, discuss the procedure for installing a dimmer switch.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss the procedures used to install dimmer switches. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and demonstrate the correct procedures for installing dimmer switches.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any problems students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-6-E-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding safety when switches are installed.

THE NEXT LESSON IS: Exterior Finishes.

LESSON PLAN

CARPENTRY

UNIT:	Exterior Finish
TOPIC:	Exterior Finishes
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(e)(1)(H)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install exterior finishes correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to identify and state the purpose and use of exterior finishes correctly.

TOOLS AND EQUIPMENT:	Hammer, skill saw, sawhorses, 25′ steel tape, framing square, chalkline, handsaw, speed square, nails
MATERIALS:	1 bundle of 16" wood shingles, building paper, wood sheathing, 1 sheet 1/2" plywood, nails, sealer to fire-proof, brush, 2" x 6" material as required, 1/2" quarter round molding, furring strip, shingle molding or drip edge, blueprint furnished by instructor, fascia board
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* II-7-A-IS II-7-A-AS II-7-A-JS-1 II-7-A-JS-2

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

The exterior finish is very important. The exterior finish should be attractive, energy efficient, and long lasting. After this lesson, you will be able to identify the different types and uses of exterior finishes correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-7-A-IS as a guide, discuss the purpose of exterior finishes.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-2-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students review and discuss different types of exterior finishes. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the use of soffits with exterior finish.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss the use of vertical siding.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-7-A-AS, II-7-A-JS-1, and II-7-A-JS-2 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the procedures for applying different types of exterior finish.

THE NEXT LESSON IS: Wall Covering Wood Shingle Panels

LESSON PLAN

CARPENTRY

UNIT:	Exterior Finish
TOPIC:	Wall Covering-Wood Shingle Panels
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),E;(e)(1)(H)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install exterior finishes correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to construct wood shingle panels correctly.

TOOLS AND EQUIPMENT:	Hammer, skill saw, sawhorses, 25′ steel tape, framing square, chalkline
MATERIALS:	1 bundle of 16" wood shingles, building paper, wood sheathing, 1 sheet 1/2" plywood, nails, sealer to fireproof, brush
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* II-7-A-IS II-7-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

The exterior finish should be attractive, energy efficient, and long lasting. After this lesson, you will be able to identify the different types and uses of exterior finishes correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-7-A-JS-1 as a guide, discuss shingle information provided.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-2-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students review and discuss procedures to construct and apply exterior finishes. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. **Discuss the use of panels with shingles.**

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. **Observe students while completing the job sheet.**

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-7-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the procedures for applying shingled panels to exterior walls.

THE NEXT LESSON IS: Construct an Open Cornice

LESSON PLAN

CARPENTRY

UNIT:	Exterior Finish
TOPIC:	Construct an Open Cornice
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),)E;(c)(1)(H)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install exterior finishes correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to construct an open cornice correctly.

TOOLS AND EQUIPMENT:	Hammer, 25' steel tape measure, framing square, skill saw, handsaw, 10d or 12d nails, chalkline, speed square, sawhorses
MATERIALS:	2" x 6" material as required, 1/2" quarter round molding, furring strip, shingle molding or drip edge, fascia board, blueprint furnished by instructor
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* II-7-A-IS II-7-A-JS-2

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Exterior trim serves two functions: to add a finished look to the structure, and give an extra weather shield at various places. After this lesson, you will be able to construct an open cornice correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-7-A-JS-2 as a guide, review procedures and discuss.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-2-I-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students use a transparency and discuss the different cornice parts. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the difference between each type of cornice.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss installation procedures for different types of cornices.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-7-A-JS-2 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the procedures and construction of different types of cornices.

THE NEXT LESSON IS: Vertical Siding

LESSON PLAN

CARPENTRY

UNIT:	Exterior Finish
TOPIC:	Vertical Siding
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(e)(1)(H)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install exterior finishes correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to install vertical siding correctly.

TOOLS AND EQUIPMENT:	Skill saw, handsaw, hammer, chalkline, 25′ steel tape measure, sawhorses, framing square, speed square, carpenter's pencil, story pole, practice wall
MATERIALS:	Plywood panels, 8 penny noncorrosive nails, caulk, water repellent, boards for corners, battens, 6d nails, bevel siding, starter strips, 1" x 2" board for story pole, blueprint or dimensions given by instructor for area to be covered
TEACHING AIDS:	Chalkboard, set of blueprints
REFERENCES:	*Building Trades II* II-7-B-IS II-7-B-AS II-7-B-JS-1 II-7-B-JS-2

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

There are several different types of vertical siding material available. After this lesson, you will be able to install vertical siding correctly .

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

I. Using II-7-B-IS as a guide, discuss and review material.

CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-2-H-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss the procedures used to install vertical siding. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss how batten is used with vertical siding.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions or problems students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-7-B-AS, II-7-B-JS-1, and II-7-B-JS-2 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the use of plywood and composition material for siding.

THE NEXT LESSON IS: Apply Siding

LESSON PLAN

CARPENTRY

UNIT:	Exterior Finish
TOPIC:	Apply Siding
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(c)(1)(H)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install exterior finishes correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to install vertical siding with batten strips correctly.

TOOLS AND EQUIPMENT:	Skill saw, handsaw, hammer, chalkline, 25′ steel tape, sawhorses, framing square, speed square, carpenter's pencil
MATERIALS:	Plywood panels, 8d noncorrosive nails, caulk, water repellent, boards for corners, batten, blueprints
TEACHING AIDS:	Chalkboard, set of blueprints
REFERENCES:	*Building Trades II* II-7-B-IS II-7-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

There are several different types of siding available. After this lesson, you will be able to install vertical siding correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-7-B-JS-1 as a guide, discuss and review information provided.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-2-C-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss the procedures used to install siding with batten strips. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and explain the different types of siding.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions or problems students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Assist students as they work on job sheets.

STUDENT ACTIVITIES (APPLICATION)

Use II-7-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the installation of different types of siding.

THE NEXT LESSON IS: Apply Bevel Siding

LESSON PLAN

CARPENTRY

UNIT:	Exterior Finish
TOPIC:	Apply Bevel Siding
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(1)(H)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install exterior finishes correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to install bevel siding correctly.

TOOLS AND EQUIPMENT:	Hammer, chalkline, framing square, 25' steel tape, sawhorses, storypole, practice wall
MATERIALS:	6d nails, bevel siding, starter strips, 1" x 2" board for storypole, blueprint or dimensions given by instructor for area to be covered
TEACHING AIDS:	Chalkboard, set of blueprints
REFERENCES:	*Building Trades II* II-7-B-IS II-7-B-JS-2

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Compare the types of siding to be used. After this lesson, you will be able to install bevel siding correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-7-B-JS-2 as a guide, discuss and review information provided.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-2-C-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students compare the difference between beveled siding and rabbetted siding. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss procedure used for bevel siding.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss the sizes of siding that are available.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-7-B-JS-2 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and/or by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the use and installation of bevel siding.

THE NEXT LESSON IS: Stucco Wall

LESSON PLAN

CARPENTRY

UNIT:	Exterior Finish
TOPIC:	Stucco Wall
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(c)(1)(H)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install exterior finishes correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to install a stucco wall correctly.

TOOLS AND EQUIPMENT:	Mortar board, cement hand trowel, hammer, framing square, chalkline, hacksaw, skill saw, noncorrosive nails
MATERIALS:	8 2" x 4" x 2' boards, 1 sheet 1/2" plywood, metal lath, 18 gauge 1" mesh, building paper, metal bead, blueprint, sketches
TEACHING AIDS:	Chalkboard, balloon frame drawing in back of student materials
REFERENCES:	*Building Trades II* II-7-C-IS II-7-C-AS II-7-C-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

A stucco wall is clean, leaves a good finish, and provides good insulation. After this lesson, you will be able to construct a stucco wall.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-7-C-IS as a guide, discuss information provided.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students draw to scale the detail for a balloon frame to be used with stucco walls. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss why a metal lath is used.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss why galvanized furring nails are used in constructing stucco walls.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-7-C-AS and II-7-C-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the reasons stucco material may crack.

THE NEXT LESSON IS: Construct Stucco Wall

LESSON PLAN

CARPENTRY

UNIT:	Exterior Finish
TOPIC:	Construct Stucco Wall
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(1)(H)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install exterior finishes correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to construct a stucco wall correctly.

TOOLS AND EQUIPMENT:	Mortar board, cement hand trowel, hammer, framing square, chalkline, hacksaw, skill saw, noncorrosive nails
MATERIALS:	8- 2" x 4" x 2' boards, 1 sheet 1/2" plywood, 18 gauge 1" mesh, metal lath, building paper, metal bead, blueprint, sketches
TEACHING AIDS:	Chalkboard, blueprints
REFERENCES:	*Building Trades II* II-7-C-IS II-7-C-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

A stucco wall is clean, leaves a good finish, and provides good insulation. After this lesson, you will be able to construct a stucco wall.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-7-C-JS-1 as a guide, review and discuss the various materials used.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss and draw a section of a stucco wall and discuss the use of each part. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss why building paper is used.

    CHECK FOR KNOWLEDGE

    RETEACH ACTIVITIES

    EXTENSION ACTIVITIES

3. Discuss and explain how the metal bead is installed.

    CHECK FOR KNOWLEDGE

    RETEACH ACTIVITIES

    EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-7-C-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding procedures for constructing a stucco wall.

THE NEXT LESSON IS: Closed Cornice

LESSON PLAN

CARPENTRY

UNIT:	Exterior Finish
TOPIC:	Closed Cornice
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(e)(1)(H)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install exterior finishes correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to install a closed cornice correctly.

TOOLS AND EQUIPMENT:	Overhead projector, calculator, pencil, 25′ steel tape, 12" scale
MATERIALS:	Poster board, paper, blueprint or working drawing
TEACHING AIDS:	Chalkboard, set of blueprints and working drawings; make transparencies from art in the information sheet.
REFERENCES:	*Building Trades II* II-7-D-IS II-7-D-AS II-7-D-JS-1 II-7-D-JS-2

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

There are several types of cornices used. They are usually designed by the architect. After this lesson, you will be able to construct a closed cornice.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-7-D-IS as a guide, discuss the different parts of a cornice.

CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

EXTENSION ACTIVITIES: Extend the learning for the student(s). Using TM-9 or a blueprint, have students draw and label a rake cornice . In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the difference between a closed cornice and a rake cornice.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions or problems students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-7-D-AS, II-7-D-JS-1, and II-7-D-JS-2 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the design of the closed cornice.

THE NEXT LESSON IS: Sketch Cornice

LESSON PLAN

CARPENTRY

UNIT:	Exterior Finish
TOPIC:	Sketch Cornice
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(e)(1)(H)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to demonstrate the correct knowledge associated with exterior finishing.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will have demonstrated the ability to identify and state the correct purpose of a cornice.

TOOLS AND EQUIPMENT:	12" ruler
MATERIALS:	Paper, pencil
TEACHING AIDS:	Chalkboard, set of blueprints and working drawings, TM-9
REFERENCES:	*Building Trades II* II-7-D-IS II-7-D-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

By drawing the closed cornice, you will better understand how to construct the cornice. After this lesson, you will be able to construct a cornice.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-7-D-JS-1 as a guide, discuss information used to draw cornice detail.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I.* Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students explain the different cornice parts drawn. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the parts of a closed cornice.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions or problems students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-7-D-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the parts of a closed cornice and a rake cornice.

THE NEXT LESSON IS: Estimating Soffit Material

LESSON PLAN

CARPENTRY

UNIT:	Exterior Finish
TOPIC:	Estimating Soffit Material
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(c)(1)(H)
TYPE OF LESSON:	Cognitive, psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install exterior finishes correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to estimate material and cost for soffit material correctly.

TOOLS AND EQUIPMENT:	Calculator, pencil, 25′ steel tape, 12" scale
MATERIALS:	Paper, blueprint or working drawing
TEACHING AIDS:	Chalkboard, blueprints or working drawing
REFERENCES:	*Building Trades II* II-7-D-IS II-7-D-JS-2

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Using a blueprint or a working drawing you will be able to estimate the material needed for projects. After this lesson, you will be able to estimate the material for a soffit correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-7-D-JS-2 as a guide, discuss procedures to estimate sofit material.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-3-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students explain procedures used to estimate soffit material. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and explain what happens if a contractor fails to make an accurate estimate.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss the importance of making estimates which are close to the actual cost.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-7-D-JS-2 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the use of estimates in building trades.

THE NEXT LESSON IS: Gutters

LESSON PLAN
CARPENTRY

UNIT:	Exterior Finish
TOPIC:	Gutters
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(e)(1)(H)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install exterior finishes correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to install gutters correctly.

TOOLS AND EQUIPMENT:	Hammer, 25′ steel tape, chalkline, 100′ tape measure
MATERIALS:	Pop rivets or sheet metal screws, guttering, end caps, bar hangers, fascial apron, rectangular downspout clip, rectangular downspout tube, rectangular downspout, roof apron, inside and outside mitered corners expansion joints, blueprints or working drawings
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* II-7-E-IS II-7-E-AS II-7-E-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Gutters are very useful in routing water from the roof and away from the house. After this lesson, you will be able to install gutters correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-7-E-IS as a guide, discuss various types of gutters.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss different types of gutters and materials used. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the use of gutters and the expense of using gutters.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss the parts of a gutter system.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-7-E-AS and II-7-E-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the materials used to make gutters.

THE NEXT LESSON IS: Install a Metal Gutter

LESSON PLAN

CARPENTRY

UNIT:	Exterior Finish
TOPIC:	Install a Metal Gutter
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(1)(H)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install gutters correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to install gutters correctly.

TOOLS AND EQUIPMENT:	Hammer, 25′ steel tape, chalkline, 100′ tape measure
MATERIALS:	Pop rivets or sheet metal screws, guttering, end caps, bar hangers, fascial apron, rectangular downspout clip, rectangular downspout tube, rectangular downspout, roof apron, inside and outside mitered corners, expansion joints, blueprints or working drawings.
TEACHING AIDS:	Chalkboard, blueprints or working drawings
REFERENCES:	*Building Trades II* II-7-E-IS II-7-E-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Gutters are very useful in routing water from the roof and away from the house. After this lesson, you will be able to install gutters correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using II-7-E-JS-1 as a guide, review procedures used to install gutters.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss different types of materials used for gutters and how they are installed. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Have students discuss how parts of the gutter are installed.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss questions and problems students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use II-7-E-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the procedure for leveling the gutter system.

THE NEXT LESSON IS: Next you will begin a new unit, Masonry

III-1-A-LP

LESSON PLAN

MASONRY

UNIT:	Orientation
TOPIC:	Careers in the Masonry Field
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(c)(2)
TYPE OF LESSON:	Cognitive
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to demonstrate an awareness of career opportunities in the masonry field correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to identify and state the purpose of career opportunities in the masonry field correctly.

TOOLS AND EQUIPMENT:	No special tools or equipment are required.
MATERIALS:	*Occupational Outlook Handbook*
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* III-1-A-IS III-1-A-AS

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

There are a variety of jobs in the masonry/stonemasonry field. After this lesson, you will understand the many career opportunities in the masonry field.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using III-1-A-IS as a guide, discuss the different career opportunities available in the masonry field.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, IV-1-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students use the *Occupational Outlook Handbook* to discuss career opportunities available in the masonry field. Have students predict new and emerging career opportunities in the masonry field. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the similarities between the job tasks performed by masons and bricklayers.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss earnings, working conditions, and outlook for career opportunities in the masonry field.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use III-1-A-AS as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheet.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding career opportunities for masons and stonemasons.

THE NEXT LESSON IS: Related Occupations

LESSON PLAN

MASONRY

UNIT:	Orientation
TOPIC:	Related Occupations
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(c)(2)
TYPE OF LESSON:	Cognitive
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to demonstrate an awareness of career opportunities in the masonry field correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to identify and state the purpose of related occupations in the masonry field correctly.

TOOLS AND EQUIPMENT:	No special tools and equipment are required.
MATERIALS:	No special materials are required.
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* III-1-B-IS III-1-B-AS

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Many career opportunities in building trades are closely related to the masonry field. After this lesson, you will understand the related occupations in the masonry field.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using III-1-B-IS as a guide, review information on occupations available.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-2-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students interview someone whose career would be closely related to the masonry field, and report their findings in class. Have students evaluate their suitability for employment in the occupation. Have students defend their assessment. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss information provided, including the specific job tasks of related occupations.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions students may have. Emphasize the education and training requirements for the related occupations discussed.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use III-1-B-AS as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheet.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the related occupations in the masonry field.

THE NEXT LESSON IS: Finishing Tools

LESSON PLAN

MASONRY

UNIT:	Tools and Materials
TOPIC:	Finishing Tools
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(c)(2)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to demonstrate the correct use of finishing tools and heavy equipment used in bricklaying/stone-masonry.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to use edgers, groovers, floats, and power joint cutters correctly, which are used in bricklaying/ stone-masonry.

TOOLS AND EQUIPMENT:	Overhead projector, display of finishing tools--edger, groover, float, power joint cutter, darby, metal concave beading tool, face hammer, mash hammer, bush hammer
MATERIALS:	No special materials are required.
TEACHING AIDS:	Chalkboard; make transparencies from art work in information sheet.
REFERENCES:	*Building Trades II* III-2-A-IS III-2-A-AS III-2-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

There are many tools used in the masonry field. It is important that you learn to identify these tools. By the end of this lesson, you will learn to identify edgers, groovers, floats, and power joint cutters used in bricklaying/stonemasonry correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using III-2-A-IS as a guide, discuss types of edgers used in masonry work.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, IV-2-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students examine finishing tools in the display. Answer questions students may have. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and demonstrate the use of floats and groovers in masonry work.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss and demonstrate the use of power joint cutters.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use III-2-A-AS and III-2-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheet and/or by observing the students complete the job sheets.

SUMMARY/CLOSURE

Review information provided. Randomly ask questions regarding the tools discussed in this lesson.

THE NEXT LESSON IS: Tool Identification

LESSON PLAN

MASONRY

UNIT:	Masonry
TOPIC:	Tool Identification
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D)(E)
TYPE OF LESSON:	Cognitive
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to demonstrate the correct use of finishing tools and heavy equipment used in bricklaying/stone masonry.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to identify and explain the correct use of masonry tools.

TOOLS AND EQUIPMENT:	Edger, groover, float, power joint cutter, darby, metal concave beading tool, face hammer, mash hammer, bush hammer
MATERIALS:	N/A
TEACHING AIDS:	Chalkboard, overhead projector, transparency of tools
REFERENCES:	*Building Trades II* III-2-A-IS III-2-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Many tools are used by masons. It is important to learn to identify these tools. After this lesson, you will be able to identify tools used by masons correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using III-2-A-JS-1 as a guide, discuss the different types of tools used in masonry.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, IV-2-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Provide opportunities to examine the floats, groovers, and different types of hammers. Mix tools and have students identify and explain how to use them. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the use of the different types of hammers used with masonry work.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss when floats should be used in masonry work.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use III-2-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheet and/or by observing the students complete the job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the tools discussed in this lesson.

THE NEXT LESSON IS: Heavy Equipment

LESSON PLAN

MASONRY

UNIT:	Tools and Materials
TOPIC:	Heavy Equipment
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(2)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to demonstrate the correct use of finishing tools and heavy equipment used in bricklaying/stone-masonry.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to use the heavy equipment used in bricklaying/stonemasonry correctly.

TOOLS AND EQUIPMENT:	5 gallon can, power mixer (gas-powered), trowel, shovel, mortar box
MATERIALS:	Portland cement, 1 bag lime, sand, water and other materials required
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* III-2-B-IS III-2-B-AS III-2-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

In order to complete some jobs, you will need to operate heavy equipment. After this lesson, you will be able to use the heavy equipment required to complete bricklaying/stonemasonry jobs.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using III-2-B-IS as a guide, review information on heavy equipment.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I,* IV-2-C-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students analyze the heavy equipment discussed, and determine the cost-effectiveness of using the equipment to complete various jobs. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss when a power troweler should be used.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss when a power screed should be used.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use III-2-B-AS and III-2-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheet and/or by observing the students as they complete the job sheet.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the use of various types of heavy equipment.

THE NEXT LESSON IS: Mixing Mortar with the Power Mixer

LESSON PLAN

MASONRY

UNIT:	Tools and Materials
TOPIC:	Mixing Mortar with the Power Mixer
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(c)(2)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to demonstrate the correct use of finishing tools and heavy equipment used in bricklaying/stone-masonry.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to use the power mixer to mix mortar correctly.

TOOLS AND EQUIPMENT:	5 gallon can, gas-powered power mixer, trowel, shovel, mortar box
MATERIALS:	Portland cement, 1 bag lime, sand, water and other materials required
TEACHING AIDS:	Chalkboard, visit to job locations
REFERENCES:	*Building Trades II* III-2-B-IS III-2-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

There is a wide variety of heavy equipment used with masonry work. After this lesson, you will be able to use a power mixer correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using III-2-B-JS-1 as a guide, review procedure on job sheet.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, IV-2-C-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students explain and demonstrate safety procedures when working with heavy equipment. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss how a power mixer is operated.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss the use of tools and safety around a power mixer.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use III-2-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheet and/or by observing the students as they complete the job sheet.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the use of power mixers and safety procedures used with heavy duty equipment.

THE NEXT LESSON IS: Mortar Consistency

LESSON PLAN

MASONRY

UNIT:	Basic Information for Bricklaying/Stonemasonry
TOPIC:	Mortar Consistency
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(2)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to mix mortar, build a stone wall, and clean stonework correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to mix mortar correctly.

TOOLS AND EQUIPMENT:	Handsaw, band clamps, hoe, plastic buckets, 2-ft. sq. plywood, screwdriver, pliers, and shovel
MATERIALS:	1 bag of premixed Sakrete, marbles, colored stones, water, and a 2 ft. 2" x 4"
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* III-3-A-IS III-3-A-AS III-3-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Explain that it is important for mortar to be mixed properly. Randomly ask students to describe what could happen if mortar is not mixed correctly. After this lesson, you will be able to mix mortar correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using III-3-A-IS as a guide, review information and discuss mortar properties.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, IV-3-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students use reference books to prepare a list of different types of mortar mixes, and discuss when they are used. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and demonstrate the techniques used to mix mortar.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Emphasize the proper consistency of mortar. Observe students.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use III-3-A-AS and III-3-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheet or by observing students as they complete the job sheet.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the use of mortar.

THE NEXT LESSON IS: Making Stepping Stones

III-3-A-LP-1

LESSON PLAN

MASONRY

UNIT:	Basic Information for Bricklaying/Stonemasonry
TOPIC:	Making Stepping Stones
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(2)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to mix mortar, build a stone wall, and clean stonework correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will demonstrate the ability to make stepping stones used for walkways and patios correctly.

TOOLS AND EQUIPMENT:	Handsaw, band clamps, hoe, plastic buckets, 2-ft. sq. plywood, screwdriver, pliers, and shovel
MATERIALS:	1 bag of premixed Sakrete, marbles, colored stones, water, and a 2-ft. 2" x 4"
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* III-3-A-IS III-3-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

By the end of the lesson, the students will be able to make stepping stones used for walkways and patios correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using III-3-A-JS-1 as a guide, discuss procedures.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-2-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students sketch the proper placement of stepping stones in a high-traffic area of the school grounds. Have students determine the number of stones needed and the approximate cost. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and demonstrate the procedures for completing the job sheet.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any problems or questions students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use III-3-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheet or by observing students as they complete the job sheet.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the procedures on the job sheet.

THE NEXT LESSON IS: Building a Stone Wall

LESSON PLAN

MASONRY

UNIT:	Basic Information for Bricklaying/Stonemasonry
TOPIC:	Building a Stone Wall
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(c)(2)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to mix mortar, build a stone wall, and clean stonework correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to build a stone wall correctly.

TOOLS AND EQUIPMENT:	Overhead projector, trowel, stone mason's hammer, caulking trowel, shovel hoe, level and mason line, chalk marker, sledge hammer
MATERIALS:	Mortar mix nonstaining cement, hydrate lime, washed sandstone ties, noncorrosive plastic or wood pads, stone rubble
TEACHING AIDS:	Chalkboard; make transparencies from art work in information sheet.
REFERENCES:	*Building Trades II* III-3-B-IS III-3-B-AS III-3-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Stones and materials must be placed correctly in order to build a sturdy, attractive stone wall. After this lesson, you will be able to build a stone wall.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using III-3-B-IS as a guide, review information and transparencies.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, IV-2-D-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students review and discuss how material is placed when walls are built. Allow students to participate in a tour of your community to evaluate the construction of various stone walls. Have students state the reasons for their evaluations. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and demonstrate how bond stones should be placed.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss and demonstrate the proper procedure for building a stone wall.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use III-3-B-AS and III-3-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheet or by observing students as they complete the job sheet.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding any problems students may have with procedures.

THE NEXT LESSON IS: Construct A Stone wall

III-3-B-LP-1

LESSON PLAN

MASONRY

UNIT:	Tools and Materials
TOPIC:	Construct a Stone Wall
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(c)(2)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to mix mortar, build a stone wall, and clean stonework correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to build a stone wall correctly.

TOOLS AND EQUIPMENT:	Trowel, stonemason's hammer, caulking trowel, shovel, hoe, level and mason line, chalk marker, sledge hammer
MATERIALS:	Nonstaining cement mortar mix, hydrated lime, washed sandstone ties, noncorrosive plastic or wood pads, stone rubble
TEACHING AIDS:	Chalkboard, or trip to job site.
REFERENCES:	*Building Trades II* III-3-B-IS III-3-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Stones and materials must be placed correctly in order to build a sturdy, attractive stone wall.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using III-3-B-JS-1 as a guide, review procedures on job sheet.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I,* IV-2-D-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students explain how to keep a stone wall straight, and what procedure is used to check the wall. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss procedures for mixing mortar to be used on a stone wall.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any problems or questions students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use III-3-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheet or by observing students as they complete the job sheet.

SUMMARY/CLOSURE

Review information provided. Ask questions about placement of bond stones in a stone wall.

THE NEXT LESSON IS: Cleaning Stonework

III-3-C-LP

LESSON PLAN

MASONRY

UNIT:	Basic Information for Bricklaying/Stonemasonry
TOPIC:	Cleaning Stonework
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(2)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to mix mortar, build a stone wall, and clean stonework correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to clean stonework correctly.

TOOLS AND EQUIPMENT:	No special tools or equipment are required.
MATERIALS:	No special materials are required.
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* III-3-C-IS III-3-C-AS

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Cleaning stonework can be a difficult, time-consuming task. You will learn many valuable shortcuts in this lesson.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using III-3-C-IS as a guide, discuss the cleaning process for stone walls.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students make a list of cleaning materials used and discuss their purposes. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Review procedure used to clean stone walls.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss why different chemicals are used when cleaning stone and brick walls.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use III-3-C-AS as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheet.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding procedures used in cleaning stone walls.

THE NEXT LESSON IS: Foundation Walls

LESSON PLAN

MASONRY

UNIT:	Construction Processes
TOPIC:	Foundation Walls
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(c)(2)
TYPE OF LESSON:	Cognitive; Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct foundation, damp-proof, and cavity walls and repair cracks correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to construct foundation walls correctly.

TOOLS AND EQUIPMENT:	Skill saw, hammer, speed square, framing square, 25 foot steel tape, carpenter's pencil
MATERIALS:	4-8′ studs, sheet of plywood, oil, filler for holes
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* III-4-A-IS III-4-A-AS III-4-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Foundation walls should rest on footings that go beyond the wall to solid ground. At the end of the lesson, you will be able to use techniques for constructing walls correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using III-4-A-IS as a guide, discuss the reasons for the way foundation walls are constructed.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, IV-4-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students review information and procedures for foundation walls. Review information sheet for footing in Building Trades I, IV-4-A-IS. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss information and demonstrate procedures for constructing foundation walls.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss why footings are important.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use III-4-A-AS and III-4-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheet or by observing students as they complete the job sheet.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the techniques used for constructing foundation walls.

THE NEXT LESSON IS: Forms for Concrete Walls

III-4-A-LP-1

LESSON PLAN

MASONRY

UNIT:	Construction Processes
TOPIC:	Forms for Concrete Walls
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(2)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct foundation, damp-proof, and cavity walls and repair wall cracks correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to construct and set sill bolts in concrete correctly.

TOOLS AND EQUIPMENT:	Skill saw, hammer, speed square, framing square, 25 ft. steel tape, carpenter's pencil
MATERIALS:	4- 8′ studs, 1 sheet plywood, oil, filler for holes
TEACHING AIDS:	Chalkboard, or trip to job site.
REFERENCES:	*Building Trades II* III-4-A-IS III-4-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

There are several types of forms used in masonry field work. After this lesson, you will be able to construct forms for concrete walls.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using III-4-A-JS-1 as a guide, review procedures to be used on job sheet.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, IV-4-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss how forms should be used for concrete walls. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss how forms are attached to footings.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss types of reinforcement used in forms for concrete walls.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use III-4-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheet or by observing students as they complete the job sheet.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the alignment of forms used for concrete walls.

THE NEXT LESSON IS: Damp-proofing Walls

III-4-B-LP

LESSON PLAN

MASONRY

UNIT:	Construction Processes
TOPIC:	Damp-proofing Walls
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(2)
TYPE OF LESSON:	Cognitive
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct foundation, damp-proof, and cavity walls and repair wall cracks correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to construct damp-proof walls correctly.

TOOLS AND EQUIPMENT:	(1"x12"x6') practice board, chalkline, mortar stand, shovel, mason's level, trowel, S-shaped joint raker, mop
MATERIALS:	Four concrete blocks (one corner block and three stretcher blocks) bituminous primer, coldtar, portland cement, hydrated lime, sand, water
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* III-4-B-IS III-4-B-AS III-4-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

There are several different ways of damp-proofing. After completing this lesson, you will be able to use these procedures correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using III-4-B-IS as a guide, discuss terminology used in damp-proofing walls.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I,* make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students list and discuss different ways to damp-proof walls. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss information provided, including the amount of time elapsed between coatings.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss why a cove should be formed and how to do it.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use III-4-B-AS and III-4-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheet or by observing students as they complete the job sheet.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding damp-proofing walls.

THE NEXT LESSON IS: Construct a Simple Block Wall and Waterproof

LESSON PLAN

MASONRY

UNIT:	Construction Processes
TOPIC:	Construct a Simple Block Wall and Waterproof
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(c)(2)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct foundation, damp-proof, and cavity walls and repair wall cracks correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to construct a simple block wall and waterproof a wall correctly.

TOOLS AND EQUIPMENT:	1" x 12" x 6' practice board, chalkline, mortar stand, shovel, mason's level, trowel, S-shaped joint raker, mop
MATERIALS:	Four concrete blocks (one corner block and three stretcher blocks), bituminous primer, coldtar, portland cement, hydrated lime, sand, water
TEACHING AIDS:	Chalkboard, blueprints
REFERENCES:	*Building Trades II* III-4-B-IS III-4-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

There are several different ways of damp-proofing. After completing this lesson, you will be able to use these procedures correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using III-4-B-JS-1 as a guide, discuss procedures used to damp-proof walls.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students list and discuss the different ways to damp-proof walls. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss why the time lapse between each coating is important.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any problems or questions students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use III-4-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheet or by observing students as they complete the job sheet.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the different procedures to damp-proof walls, and materials used.

THE NEXT LESSON IS: Cavity Walls

LESSON PLAN

MASONRY

UNIT:	Construction Processes
TOPIC:	Cavity Walls
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(c)(2)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct foundation, damp-proof, and cavity walls and repair wall cracks correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to construct a cavity wall correctly.

TOOLS AND EQUIPMENT:	Overhead projector, pencil, fractional rule
MATERIALS:	8 1/2" x 11" paper, cavity wall sketch located in back of student manual
TEACHING AIDS:	Chalkboard, make transparencies of art in information sheet, set of blueprints and working drawings
REFERENCES:	*Building Trades II* III-4-C-IS III-4-C-AS III-4-C-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Cavity walls can serve as insulation and help to keep moisture away from the inside wall. After this lesson, you will be able to construct the cavity wall correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using III-4-C-IS as a guide, review and discuss advantages of a cavity wall.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students review and discuss with the rest of the class the use of cavity walls. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss how the facing and back wythes are connected.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss the difference between the exterior wythe and the interior wythe.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use III-4-C-AS and III-4-C-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheet or by observing students as they complete the job sheet.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the construction procedures used to construct cavity walls.

THE NEXT LESSON IS: Draw Cavity Wall Detail

LESSON PLAN
MASONRY

UNIT:	Construction Processes
TOPIC:	Draw Cavity Wall Detail
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(2)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct foundation, damp-proof, and cavity walls and repair wall cracks correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to draw a cavity wall detail correctly.

TOOLS AND EQUIPMENT:	Pencil, fractional rule
MATERIALS:	8 1/2" x 11" paper, cavity wall sketch located in the back of student manual
TEACHING AIDS:	Chalkboard, blueprints and working drawings
REFERENCES:	*Building Trades II* III-4-C-IS III-4-C-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

By drawing a cavity wall, you will have a better understanding of the function of this type of wall.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using III-4-C-JS-1 as a guide, draw sketch as shown.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, IV-2-B-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students explain the use of detail drawings of cavity walls. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the job sheet.

    CHECK FOR KNOWLEDGE

    RETEACH ACTIVITIES

    EXTENSION ACTIVITIES

3. Discuss any questions students may have.

    CHECK FOR KNOWLEDGE

    RETEACH ACTIVITIES

    EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use III-4-C-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheet or by observing students as they complete the job sheet.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding procedures used to complete the drawing of the cavity wall.

THE NEXT LESSON IS: Repairing Wall Cracks

LESSON PLAN

MASONRY

UNIT:	Construction Processes
TOPIC:	Repairing Wall Cracks
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(c)(2)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct foundation, damp-proof, and cavity walls and repair wall cracks correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to repair cracks in brick and stone walls correctly.

TOOLS AND EQUIPMENT:	Caulk gun; small, steel brush; whisk broom
MATERIALS:	Elastic or joint compound sealant
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* III-4-D-IS III-4-D-AS III-4-D-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Most brick or stone walls, at some time, will develop cracks which are caused by the settling of the soil foundation. After this lesson, you will be able to repair cracks in brick and stone walls correctly .

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using III-4-D-IS as a guide, review and discuss types of wall cracks.

CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students explain how cracks are created when soil settles. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss why you would use an elastic type filler instead of normal caulking.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss how expansion cracks should be repaired.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use III-4-D-AS and III-4-D-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheet or by observing students as they complete the job sheet.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the techniques used to fill different types of cracks.

THE NEXT LESSON IS: Repairing Wall Cracks

LESSON PLAN

MASONRY

UNIT:	Construction Processes
TOPIC:	Repairing Wall Cracks
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(c)(2)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct foundation, damp-proof, and cavity walls and repair wall cracks correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to repair cracks in brick and stone walls correctly.

TOOLS AND EQUIPMENT:	Caulk gun; small, steel brush; whisk broom
MATERIALS:	Elastic or joint compound sealant
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* III-4-D-IS III-4-D-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

In the previous lesson, you learned the correct procedure for repairing cracks in brick and stone walls. In this lesson, you will have an opportunity to repair cracks in brick and stone walls.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using III-4-D-JS-1 as a guide, discuss the procedure to repair cracks.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students demonstrate how a wall is repaired. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the difference between settlement cracks and expansion cracks.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions or problems students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use III-4-D-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheet or by observing students as they complete the job sheet.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the correct procedure for repairing cracks in brick and stone walls.

THE NEXT LESSON IS: Blueprint Reading

LESSON PLAN

MASONRY

UNIT:	Blueprints and Working Drawings
TOPIC:	Blueprint Reading
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(c)(2)
TYPE OF LESSON:	Cognitive
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to read and interpret blueprints correctly.

TOOLS AND EQUIPMENT:	Overhead projector, tape measure, 12-inch ruler, pencil
MATERIALS:	Set of blueprints (provided by instructor), paper
TEACHING AIDS:	Chalkboard, make transparencies from art in information sheet, set of blueprints and working drawings.
REFERENCES:	*Building Trades II* III-5-A-IS III-5-A-AS III-5-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Blueprints and working drawings convey language which is used to communicate with contractors, workers, and architects. After completing this lesson, you will be able to read and understand correctly blueprint line symbols and dimensions used in masonry construction.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using III-5-A-IS as a guide, discuss information and review.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, IV-2-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students draw symbols and lines used in blueprints and working drawings. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and review the different lines used on blueprints and working drawings.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss the different symbols and abbreviations used on blueprints and working drawings.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use III-5-A-AS and III-5-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheet or by observing students as they complete the job sheet.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding abbreviations and terminology used in blueprints and working drawings.

THE NEXT LESSON IS: Reading Blueprints and Working Drawings

LESSON PLAN

MASONRY

UNIT:	Blueprints and Working Drawings
TOPIC:	Reading Blueprints and Working Drawings
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(2)
TYPE OF LESSON:	Cognitive; Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to read and interpret blueprints correctly.

TOOLS AND EQUIPMENT:	Tape measure, 12" ruler, pencil
MATERIALS:	Set of blueprints (provided by instructor), paper
TEACHING AIDS:	Chalkboard, blueprints
REFERENCES:	*Building Trades II* III-5-A-IS III-5-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Blueprints and working drawings are used to communicate with contractors, workers and architects. After completing this lesson, you will be able to read and understand blueprints correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using III-5-A-JS-1 as a guide, review procedures on the job sheet.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I,* II-1-C-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students review information and discuss various parts of blueprints and working drawings. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the primary use of details.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions and problems students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use III-5-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheet or by observing students as they complete the job sheet.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the primary use of blueprints and specifications.

THE NEXT LESSON IS: Scale and Dimensions

LESSON PLAN

MASONRY

UNIT:	Blueprints and Working Drawings
TOPIC:	Scale and Dimensions
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(c)(2)
TYPE OF LESSON:	Cognitive
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to read and interpret blueprint scales and dimensions correctly.

TOOLS AND EQUIPMENT:	Sharp pencil, fractional rule
MATERIALS:	11 1/2" x 20" paper; foundation plan sheet from back of student manual
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* III-5-B-IS III-5-B-AS III-5-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Blueprints and working drawings come in many different forms. By the end of this lesson, you will be able to read and interpret correctly the scale and dimensions of the blueprints and working drawings used in masonry construction.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using III-5-B-IS as a guide, discuss information and review.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-2-B-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students scale a blueprint and a working drawing and explain how it was done. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the difference between regular blueprint scale and detail scale.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions or problems the students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use III-5-B-AS and III-5-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheet or by observing students as they complete the job sheet.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the term *scale* and the term *size*.

THE NEXT LESSON IS: Drawing Details

LESSON PLAN

MASONRY

UNIT:	Blueprints and Working Drawings
TOPIC:	Drawing Details
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(2)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to interpret blueprint scales and dimensions correctly.

TOOLS AND EQUIPMENT:	Sharp pencil, fractional rule
MATERIALS:	11 1/2" x 20" paper, foundation plan sheet from back of student manual
TEACHING AIDS:	Chalkboard, set of blueprints and working drawings
REFERENCES:	*Building Trades II* III-5-B-IS III-5-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Details are drawn at larger scale than normal to show specific dimensions. Details will help you understand the architect's plans. By the end of this lesson, you will be able to draw details correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using III-5-B-JS-1 as a guide, review and discuss detail drawings.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-2-B-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students draw several detail and sectional views and explain what scale was used. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and explain the purpose of the 1/4" = 1' 0" scale.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions or problems the students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use III-5-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheet or by observing students as they complete the job sheet.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the procedures used in drawing details and sectional views.

THE NEXT LESSON IS: Specifications

LESSON PLAN
MASONRY

UNIT:	Blueprints and Working Drawings
TOPIC:	Specifications
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(c)(2)
TYPE OF LESSON:	Cognitive
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to read and interpret drawing specifications correctly.

TOOLS AND EQUIPMENT:	Ruler, pencil
MATERIALS:	Set of blueprints or working drawings supplied by instructor, paper
TEACHING AIDS:	Chalkboard, set of blueprints and working drawings
REFERENCES:	*Building Trades II* III-5-C-IS III-5-C-AS III-5-C-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Specifications cover many necessary details such as insurance, payroll, and can be used to specify any changes. After completing this lesson, you will be able to interpret the specifications for drawings correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using III-5-C-IS as a guide, review information about blueprint specifications.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-2-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students review blueprint specifications and discuss the components. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Using a blueprint as a reference, discuss the specifications.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions or problems the students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use III-5-C-AS and III-5-C-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheet or by observing students as they complete the job sheet.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the different kinds of information listed in the specifications.

THE NEXT LESSON IS: **Interpret Specifications**

LESSON PLAN

MASONRY

UNIT:	Blueprints and Working Drawings
TOPIC:	Interpret Specifications
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(2)
TYPE OF LESSON:	Cognitive
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to read and interpret drawing specifications correctly.

TOOLS AND EQUIPMENT:	Ruler, pencil
MATERIALS:	Set of blueprints or working drawings furnished by instructor, paper
TEACHING AIDS:	Chalkboard, blueprints
REFERENCES:	*Building Trades II* III-5-C-IS III-5-C-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

The specifications cover many necessary details such as insurance, payroll, and can be used to specify any changes. After completing this lesson, you will be able to interpret the specifications for drawings correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using III-5-C-JS-1 as a guide, review information and discuss.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, II-1-C-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students use different blueprints and discuss the specifications sections on them. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss information shown in the specifications.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Have students explain why specifications are necessary.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use III-5-C-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheet or by observing students as they complete the job sheet.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding blueprints and working drawings, and discuss the different types of specifications.

THE NEXT LESSON IS: **Next unit is Residential Electrician**

IV-1-A-LP

LESSON PLAN

RESIDENTIAL ELECTRICIAN

UNIT:	Electrical Safety
TOPIC:	Grounding
ESSENTIAL ELEMENT(S):	(a)(4);(a)(7)(A),(C);(e)(3)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to demonstrate skills associated with electrical safety.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to use grounding techniques correctly.

TOOLS AND EQUIPMENT:	No special tools or equipment are required.
MATERIALS:	No special materials are required.
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* IV-1-A-IS IV-1-A-AS

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Electricity is one of our most versatile forms of energy and must be used with great caution. Ask students if they know of an accident that occurred because proper grounding techniques were not used. Explain that after this lesson, they will be able to use electricity correctly and safely.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using IV-1-A-IS as a guide, discuss types of grounding.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I,* V-1-A-IS, V-1-B-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have a representative from Texas Utilities meet with the class and discuss safety procedures. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss system grounding safety.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss equipment grounding safety.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions that require both individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use IV-1-A-AS as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding procedures to ensure safe grounding practices.

THE NEXT LESSON IS: Circuits

LESSON PLAN

RESIDENTIAL ELECTRICIAN

UNIT:	Electrical Theory
TOPIC:	Circuits
ESSENTIAL ELEMENT(S):	(a)(7)(A),(B),(C);(e)(3)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct an electrical circuit.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to construct series and parallel circuits correctly .

TOOLS AND EQUIPMENT:	Overhead projector, diagonal pliers with stripping hole, linesman's pliers, standard screwdriver, tape measure or folding rule
MATERIALS:	#14 wire, 10 feet; four light sockets with wires; tape; one male plug; four light bulbs
TEACHING AIDS:	Chalkboard; make transparencies from artwork in information sheet.
REFERENCES:	*Building Trades II* IV-2-A-IS IV-2-A-AS IV-2-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

When working with electricity, it is important to recognize the different circuits and their functions. After this lesson, you will be able to construct a parallel and series circuit correctly. Use proper safety precautions.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using IV-2-A-IS as a guide, discuss the difference between parallel and series circuits.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, V-2-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students draw a diagram of a parallel and a series circuit and label each. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the uses of parallel and series circuits.

    CHECK FOR KNOWLEDGE

    RETEACH ACTIVITIES

    EXTENSION ACTIVITIES

3. Discuss any questions students may have.

    CHECK FOR KNOWLEDGE

    RETEACH ACTIVITIES

    EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use IV-2-A-AS and IV-2-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the use of parallel and series circuits.

THE NEXT LESSON IS: Constructing a Series Circuit

LESSON PLAN

RESIDENTIAL ELECTRICIAN

UNIT:	Electrical Theory
TOPIC:	Constructing A Series Circuit
ESSENTIAL ELEMENT(S):	(a)(7)(A),(B),(C);(e)(3)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct an electrical circuit.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to construct a series circuit correctly.

TOOLS AND EQUIPMENT:	Diagonal pliers with stripping hole, linesman's pliers, standard screwdriver, tape measure or folding rule.
MATERIALS:	#14 wire, 10 feet; four light sockets with wires; tape; one male plug; four light bulbs
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* IV-2-A-IS IV-2-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

The circuit should be completely constructed before inserting the plug. After completing this lesson, you will be able to construct a series circuit. Use proper safety precautions.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using IV-2-A-JS-1 as a guide, construct a series circuit.

CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-2-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss how series circuits are made. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Demonstrate and discuss how to lay a series circuit.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use IV-2-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the layout of a series circuit.

THE NEXT LESSON IS: Circuit Components

LESSON PLAN

RESIDENTIAL ELECTRICIAN

UNIT:	Electrical Theory
TOPIC:	Circuit Components
ESSENTIAL ELEMENT(S):	(a)(7)(A),(B),(C);(c)(3)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct an electrical circuit.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to use the color code, identify and install circuit components correctly .

TOOLS AND EQUIPMENT:	Device box, octagon box, wire staples, bar hanger, stud wall or practice board, 3/8" cable clamp, twist-on wire connectors, two 16 penny nails, two drywall nails, hammer, standard screwdriver, line technician's pliers, longnose pliers, pocket knife, wire strippers, tool pouch, drill motor or bit brace, 3/4" wood bit, extension cord, safety glasses
MATERIALS:	12-2-G or 14-2-G NM cable, single pole switch, light socket, 120 volt supply, 120 volt incandescent bulb
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* IV-2-B-IS IV-2-B-AS IV-2-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

There are many components in a circuit. After this lesson, you will be able to install these components and identify color code used with circuits correctly. Use proper safety precautions.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using IV-2-B-IS as a guide, discuss the use of the wire color code.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students display different color wires and explain their uses. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss wire sizes.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss the circuit controllers.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use IV-2-B-AS and IV-2-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the various types of circuit controllers.

THE NEXT LESSON IS: Wiring a Single Pole Switch Controlling a Single Light Outlet Supply Line Entering a Light Outlet Box

IV-2-B-LP-1

LESSON PLAN

RESIDENTIAL ELECTRICIAN

UNIT:	Electrical Theory
TOPIC:	Wiring a Single Pole Switch Controlling a Single Light Outlet Supply Line Entering a Light Outlet Box
ESSENTIAL ELEMENT(S):	(a)(7)(A),(B),(C);(e)(3)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to use color code, and identify and install circuit components correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to install circuit components correctly.

TOOLS AND EQUIPMENT:	Device box, octagon box, wire staples, bar hanger, stud wall or practice board, 3/8" cable clamp, twist-on wire connectors, two 16 penny nails, two drywall nails, hammer, standard screwdriver, line technician's pliers, longnose pliers, pocket knife, wire strippers, tool pouch, drill motor or bit brace, 3/4" wood bit, extension cord, safety glasses
MATERIALS:	12-2-G or 14-2-GNM cable, single pole switch, light socket, 120 volt supply, 120 volt incandescent bulb, blueprint
TEACHING AIDS:	Blueprint chalkboard
REFERENCES:	*Building Trades II* IV-2-B-IS IV-2-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

You have had the opportunity to learn about branch circuits. After this lesson, you will be able to install a branch circuit correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using IV-2-B-JS-1 as a guide, review procedures on job sheet.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I.* Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss procedures used to complete job sheets. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss any questions or problems students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss procedures used in completing the job sheet.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use IV-2-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding electrical theory and its uses.

THE NEXT LESSON IS: Electrical Floor Plan

IV-3-A-LP

LESSON PLAN

RESIDENTIAL ELECTRICIAN

UNIT: Blueprints and Drawings

TOPIC: Electrical Floor Plan

ESSENTIAL ELEMENT(S): (a)(7)(A),(C);(e)(3)(A)

TYPE OF LESSON: Cognitive

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to demonstrate the knowledge and ability to read and interpret blueprints and drawings.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to read and interpret electrical floor plans correctly.

TOOLS AND EQUIPMENT: Pencil, ruler

MATERIALS: Forms from blueprint section for electrical floor plans

TEACHING AIDS: Chalkboard

REFERENCES: *Building Trades II*
IV-3-A-IS
IV-3-A-AS
IV-3-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

An electrical floor plan gives you the detailed information needed to complete a project. After this lesson, you will be able to use electrical floor plans correctly. Use proper safety precautions.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using IV-3-A-IS as a guide, review information and set of plans in order to explain use of blueprints.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-2-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students review blueprints and make sketches of a service entrance and an electrical panel. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Use an electrical floor plan and discuss electrical layouts for lighting.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Use an electrical floor plan and discuss layouts for receptacles.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use IV-3-A-AS and IV-3-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the symbols used on electrical plans for receptacles, lighting, and other fixtures shown.

THE NEXT LESSON IS: Sketching Outlets and Switches

LESSON PLAN

RESIDENTIAL ELECTRICIAN

UNIT:	Blueprints and Drawings
TOPIC:	Sketching Outlets and Switches
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(e)(3)(A)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to demonstrate the knowledge and ability to read and interpret blueprints and drawings.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to read and use blueprints and drawings used in residence and light commercial wiring plans correctly.

TOOLS AND EQUIPMENT:	Pencil, ruler
MATERIALS:	Forms from blueprint section for electrical floor plans
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* IV-3-A-IS IV-3-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

The use of sketches will help you locate and understand the placement of outlets and switches. After this lesson, you will be able to locate and install electrical fixtures and equipment.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using IV-3-A-JS-1 as a guide, use blueprint to complete task.

CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-2-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss outlet and switch locations on blueprints. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss different locations and the need for special devices.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use IV-3-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the location of various fixtures, outlets, and switches.

THE NEXT LESSON IS: Wiring Circuits

IV-3-B-LP

LESSON PLAN

RESIDENTIAL ELECTRICIAN

UNIT: Blueprints and Drawings

TOPIC: Wiring Circuits

ESSENTIAL ELEMENT(S): (a)(7)(A),(C);(e)(3)(A)

TYPE OF LESSON: Cognitive; psychomotor

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to demonstrate the knowledge and ability to read and interpret blueprints and drawings.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to use the blueprint correctly to wire circuits.

TOOLS AND EQUIPMENT: Overhead projector, sharp pencil, fractions rule

MATERIALS: 11 1/2" x 20" paper, first floor plan sheet from back of student manual

TEACHING AIDS: Chalkboard

REFERENCES: *Building Trades II*
IV-3-B-IS
IV-3-B-AS
IV-3-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

The electrician will often use blueprints for a work record. After this lesson, you will understand how to use blueprints for a working record to wire circuits.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using IV-3-B-IS as a guide, use blueprint and TM to discuss different circuits.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, VI-32-B-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students use blueprints to discuss the location and installation of outside wiring. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Have students use a set of blueprints and discuss how they would use it as a work record to wire circuits.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use IV-3-B-AS and IV-3-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the use of blueprints for a work record and why they help with other electricians on the job.

THE NEXT LESSON IS: Use of Electrical Symbols

LESSON PLAN

RESIDENTIAL ELECTRICIAN

UNIT:	Blueprints and Drawings
TOPIC:	Use of Electrical Symbols
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C);(e)(3)(A)
TYPE OF LESSON:	Cognitive, Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to demonstrate the knowledge and ability to read and interpret blueprints and drawings.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to use blueprints correctly to wire circuits.

TOOLS AND EQUIPMENT:	Sharp pencil, fractions rule
MATERIALS:	11 1/2" x 20" paper, first floor plan sheet from back of student manual
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* IV-3-B-IS IV-3-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Symbols represent many different items used to construct circuits. After this lesson, you will be able to recognize and use electrical symbols.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using IV-3-B-JS-1 as a guide, complete task and discuss use of symbols.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, VI-3-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students use a set of blueprints to make a chart of symbols shown on a set of plans. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the different types of symbols used on blueprints.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Make different sketches to show the use of symbols.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use IV-3-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the use and purpose of electrical symbols.

THE NEXT LESSON IS: Ceiling Fans

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LESSON PLAN

RESIDENTIAL ELECTRICIAN

UNIT: Electrical Installation

TOPIC: Ceiling Fans

ESSENTIAL ELEMENT(S): (a)(7)(A),(C),(D),(E);(e)(3)(B)

TYPE OF LESSON: Psychomotor

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install ceiling fans, room air-conditioning units, garbage disposals, and ballast protectors.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to install ceiling fans correctly.

TOOLS AND EQUIPMENT: Four 1" wood screws, four 16 penny nails, screwdriver, tape measure, hammer

MATERIALS: 24" of #14 romax wire, electrical square-wire staple, junction box, nonmetallic, sheathed cable connector, two 2" x 6" x 1', one 2" x 4" x 16"

TEACHING AIDS: Chalkboard, set of blueprints and working drawings

REFERENCES: *Building Trades II*

IV-4-A-IS
IV-4-A-AS
IV-4-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Ceiling fans are rapidly becoming a popular air-cooling device because they circulate air and conserve energy. After this lesson, you will be able to install different ceiling fan fixtures. Use proper safety precautions.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using IV-4-A-IS as a guide, discuss the use of ceiling fans.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, V-5-B-IS, V-5-C-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss correct ways to install fixtures. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss procedures used to install ceiling fan fixtures.

CHECK FOR KNOWLEDGE

RETEACH ACTIVITIES

EXTENSION ACTIVITIES

3. Discuss any questions or problems students may have.

CHECK FOR KNOWLEDGE

RETEACH ACTIVITIES

EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use IV-4-A-AS and IV-4-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding installation of ceiling fan fixtures.

THE NEXT LESSON IS: Installing a Ceiling Fan Hanger

IV-4-A-LP-1

LESSON PLAN

RESIDENTIAL ELECTRICIAN

UNIT:	Electrical Installation
TOPIC:	Installing a Ceiling Fan Hanger
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(c)(3)(B)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install ceiling fans, room air-conditioning units, garbage disposals, and ballast protectors.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to install a hanger correctly for support of ceiling fans.

TOOLS AND EQUIPMENT:	Four one-inch wood screws, screwdriver, tape measure, four 16 penny nails, hammer
MATERIALS:	One junction box, one nonmetallic, sheathed cable connector, two 2" x 6" x 1', one 2" x 4" x 16", 24 inches of #14 romax wire, and an electrical square-wire staple
TEACHING AIDS:	Chalkboard; make transparencies from art located on job sheet
REFERENCES:	*Building Trades II* IV-4-A-IS IV-4-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

When installing fixtures, be sure the circuit will carry the fixture being installed. After this lesson, you will be able to install ceiling fan hangers. Use proper safety precautions.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using IV-4-A-JS-1 as a guide, construct a hanger for a ceiling fan.

CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, V-5-B-IS, V-5-C-IS. Make sure the students are following or comprehending what is being presented. if the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students explain how a ceiling fan hanger is made and its purpose. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Demonstrate how a hanger is made.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions or problems students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use IV-4-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the use and installation of hangers and ceiling fans.

THE NEXT LESSON IS: Room Air-Conditioning Units

IV-4-B-LP

LESSON PLAN

RESIDENTIAL ELECTRICIAN

UNIT:	Electrical Installation
TOPIC:	Room Air-Conditioning Units
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(c)(3)(B)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install ceiling fans, room air-conditioning units, garbage disposals, and ballast protectors.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to install room air-conditioners correctly.

TOOLS AND EQUIPMENT:	Overhead projector, box (be sure box will accommodate conductors being used), cover, fixed appliance with pigtail, screwdriver, pocket knife, wire stripper, safety glasses, practice wall
MATERIALS:	Connectors, two #12 x 1" metal screws, wire connectors
TEACHING AIDS:	Chalkboard; make transparency from information sheet
REFERENCES:	*Building Trades II* IV-4-B-IS IV-4-B-AS IV-4-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

An air-conditioning unit can be installed in various circuits. After this lesson, you will be able to install an air-conditioning unit correctly. Use proper safety precautions.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using IV-4-B-IS as a guide, discuss the voltage used and the type of receptacle needed.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I,* V-5-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss different types of circuits used when installing air-conditioning units. In addition you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the different types of receptacles used.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss why air-conditioning units can be on the same circuit as heating units.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use IV-4-B-AS and IV-4-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding any problems that may be encountered when installing air-conditioning units.

THE NEXT LESSON IS: **Install a Fixed Appliance Equipped with Pigtail to a Branch Circuit**

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IV-4-B-LP-1

LESSON PLAN

RESIDENTIAL ELECTRICIAN

UNIT:	Electrical Installation
TOPIC:	Install a Fixed Appliance Equipped with Pigtail to a Branch Circuit
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),)(D),(E);(c)(3)(B)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install ceiling fans, room air-conditioning units, garbage disposals, and ballast protectors correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to install a fixed appliance to a branch circuit correctly.

TOOLS AND EQUIPMENT:	Box (be sure box will accommodate conductors being used), cover, fixed appliance with pigtail, screwdriver, pocket knife, wire stripper, safety glasses, practice wall
MATERIALS:	Connectors, two #12 x 1" metal screws, wire connectors
TEACHING AIDS:	Blueprint, chalkboard
REFERENCES:	*Building Trades II* IV-4-B-IS IV-4-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

The fixed appliance can be installed in various circuits. After this lesson, you will be able to install fixed appliances in branch circuits correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using IV-4-B-JS-1 as a guide, review procedures used to complete the job sheet.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, V-5-B-IS, V-5-C-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss procedures used to install branch circuits. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss any questions or problems students may have in completing the job sheet.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Demonstrate how wiring is installed.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use IV-4-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding why several branch circuits are installed.

THE NEXT LESSON IS: Garbage Disposal

LESSON PLAN

RESIDENTIAL ELECTRICIAN

UNIT: Electrical Installation

TOPIC: Garbage Disposal

ESSENTIAL ELEMENT(S): (a)(7)(A),(C),(D),(E);(e)(3)(B)

TYPE OF LESSON: Psychomotor

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install ceiling fans, room air-conditioning units, garbage disposals, and ballast protectors.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to install a garbage disposal correctly.

TOOLS AND EQUIPMENT: Adjustable spud wrench or all-purpose wrench, strainer wrench, 2" tubing cutter, practice wall, tester

MATERIALS: Garbage disposal unit, pipe compound, 12-2-G or 14-2-G wire cable, one junction box, one switch box, one single pole switch, four twist caps

TEACHING AIDS: Chalkboard

REFERENCES: *Building Trades II*

IV-4-C-IS
IV-4-C-AS
IV-4-C-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

The disposal is connected to a switch located at counter level, usually close to the sink. After this lesson, you will be able to install the disposal correctly. Use proper safety precautions.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using IV-4-C-IS as a guide, discuss how the disposal's electrical circuit is installed.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I.* Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss how a disposal is installed. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the purpose of a garbage disposal.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions or problems students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use IV-4-C-AS and IV-4-C-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the type of circuit to be used when installing a garbage disposal.

THE NEXT LESSON IS: Install a Garbage Disposal

LESSON PLAN
RESIDENTIAL ELECTRICIAN

UNIT:	Electrical Installation
TOPIC:	Install A Garbage Disposal
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(3)(B)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install ceiling fans, room air-conditioning units, garbage disposals, and ballast protectors correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to install a garbage disposal correctly.

TOOLS AND EQUIPMENT:	Adjustable spud wrench or all-purpose wrench, strainer wrench, 2" tubing cutter, practice wall, tester
MATERIALS:	Garbage disposal unit, pipe compound, 12-2-G or 14-2-G wire cable, one junction box, one switch box, one single pole switch, four twist caps
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* IV-4-C-IS IV-4-C-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

The disposal is connected to a switch located at counter level, usually close to the sink. After this lesson, you will be able to install the disposal correctly. Use proper safety precautions.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using IV-4-C-JS-1 as a guide, review procedures used on job sheet.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I.* Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss how a disposal's electrical circuit is installed. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the purpose and use of the garbage disposal.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss safety precautions for using the garbage disposal.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use IV-4-C-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the type of circuit to be used when installing a garbage disposal.

THE NEXT LESSON IS: Ballast Protector

LESSON PLAN
RESIDENTIAL ELECTRICIAN

UNIT:	Electrical Installation
TOPIC:	Ballast Protector
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(3)(B)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install ceiling fans, room air-conditioning units, garbage disposals, and ballast protectors.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to install ballast protectors correctly.

TOOLS AND EQUIPMENT:	Side-cutting pliers, wire stripper, screwdriver
MATERIALS:	One fluorescent light fixture, 2 wire caps, 1 in-line fuse holder (Light fixture can be obtained from electrical contractor, electrician, or school maintenance. Instructor should make this available; this can be used again in other classes.)
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* IV-4-D-IS IV-4-D-AS IV-4-D-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

The ballast protector is one of many devices used in circuits to protect an appliance. After this lesson, you will be able to install ballast protectors correctly. Use proper safety precautions.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using IV-4-D-IS as a guide, discuss the use of a ballast protector.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-2-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss different kinds of protectors used in circuits. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss where ballast protectors are installed in the circuit.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions or problems students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use IV-4-D-AS and IV-4-D-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the use of circuit or ballast protectors.

THE NEXT LESSON IS: Installing In-Line Fuse Holder

LESSON PLAN

RESIDENTIAL ELECTRICIAN

UNIT:	Electrical Installation
TOPIC:	Installing In-Line Fuse Holder
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(c)(3)(B)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install ceiling fans, room air-conditioning units, garbage disposals, and ballast protectors.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to install an in-line protector for fluorescent light fixtures correctly.

TOOLS AND EQUIPMENT:	Side-cutting pliers, wire stripper, screwdriver
MATERIALS:	One fluorescent light fixture, 2 wire caps, 1 in-line fuse holder (Light fixture can be obtained from electrical contractor, electrician, or school maintenance. Instructor should make this available; this can be used again in other classes.)
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* IV-4-D-IS IV-4-D-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

The ballast protector is one of many devices used in circuits to protect an appliance. Installing an in-line fuse protector will protect the ballast and help prevent a fire in case of ballast overheating. After this lesson, you will be able to install circuit protectors correctly. Use proper safety precautions.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using IV-4-D-JS-1 as a guide, discuss how an in-line fuse holder is installed.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-2-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material either by using different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss different kinds of protectors used in circuits. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the procedure for installing an in-line fuse.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions or problems students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use IV-4-D-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding installation of in-line fuses and protectors.

THE NEXT LESSON IS: Next you will start Painting and Decorating

LESSON PLAN

PAINTING AND DECORATING

UNIT:	Surface Preparation
TOPIC:	Safety
ESSENTIAL ELEMENT(S):	(a)(7)(A);(a)(5)(F);(c)(4)
TYPE OF LESSON:	Cognitive
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to apply safety principles correctly when preparing walls and will be able to estimate paint accurately.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will identify and analyze safety principles associated with surface preparation correctly.

TOOLS AND EQUIPMENT:	No special tools or equipment are required
MATERIALS:	Labels from two different paint cans, labels from two different paint thinner cans, paper
TEACHING AIDS:	Chalkboard; samples of blueprints and working drawings.
REFERENCES:	*Building Trades II* V-1-A-IS V-1-A-AS V-1-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

There are many different ways to prepare surfaces to be painted. Unfortunately, many workers seldom consider applying safety principles when preparing surfaces for painting. After this lesson, you will be able to understand safety with painting.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using V-1-A-IS as a guide, discuss safety with surface preparation.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss safer ways to prepare walls and paint surfaces. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss ways to safely prepare surfaces to be painted.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions or problems the students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use V-1-A-AS and V-1-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions related to preparing surfaces safely.

THE NEXT LESSON IS: Safety on Labels

LESSON PLAN

PAINTING AND DECORATING

UNIT: Surface Preparation

TOPIC: Safety on Labels

ESSENTIAL ELEMENT(S): (a)(7)(A);(a)(5)(F);(c)(4)

TYPE OF LESSON: Cognitive; psychomotor

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to apply safety principles correctly when preparing walls and will be able to estimate paint accurately.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will identify and state the purpose of safety labels correctly.

TOOLS AND EQUIPMENT: No special tools and equipment are required

MATERIALS: Labels from two different paint cans, labels from two different paint-thinner cans, paper

TEACHING AIDS: Chalkboard

REFERENCES: *Building Trades II*
V-1-A-IS
V-1-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

There are many different types of paints and thinners to be used. After this lesson, you will be able to use paint and thinner correctly and safely.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using V-1-A-JS-1 as a guide, discuss procedures for using thinners.

   CHECK FOR KNOWLEDGE: Review information courses in *Building Trades I*. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss safety information found on labels. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss various types of thinners and how to use them.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions or problems students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use V-1-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the safe use of paints and thinners.

THE NEXT LESSON IS: Wall Preparation

LESSON PLAN

PAINTING AND DECORATING

UNIT:	Surface Preparation
TOPIC:	Wall Preparation
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(E);(e)(4)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to apply safety principles correctly when preparing walls and will be able to estimate paint accurately.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will prepare wall surfaces correctly.

TOOLS AND EQUIPMENT:	Flexible putty knife, sandpaper, plastic spreader, brush, small can of spackling, rag
MATERIALS:	Small can of primer or paint, 4′ x 4′ section of Sheetrock
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* V-1-B-IS V-1-B-AS V-1-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Before walls can be painted, they must be prepared. After completing this lesson, you will prepare walls to be painted correctly, using proper safety precautions.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using V-1-B-IS as a guide, discuss how to prepare a wall.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, IV-1-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Demonstrate to students how to prepare a wall for painting. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and demonstrate different ways to prepare surfaces to be painted.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss types of fillers to use on surfaces to be painted.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use V-1-B-AS and V-1-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding wall surface preparation.

THE NEXT LESSON IS: Filling Cracks

LESSON PLAN

PAINTING AND DECORATING

UNIT:	Surface Preparation
TOPIC:	Filling Cracks
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(E);(e)(4)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to apply safety principles correctly when preparing walls and will be able to estimate paint accurately.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to fill cracks in surface preparation correctly.

TOOLS AND EQUIPMENT:	Flexible putty knife, sandpaper, plastic spreader, small can of spackling, brush, rag
MATERIALS:	4' x 4' section of Sheetrock, small can of primer or paint
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* V-1-B-IS V-1-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Various types of materials require different preparation procedures. Filling cracks can be a difficult and time-consuming task if not done correctly. After this lesson, you will be able to fill cracks when preparing a wall correctly, while using proper safety precautions.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using V-1-B-JS-1 as a guide, prepare a surface to be painted.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students demonstrate how to use spackling to prepare walls to be painted. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and demonstrate the various types of fillers that can be used.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss and demonstrate the correct procedure for filling cracks.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use V-1-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the use of fillers when preparing walls.

THE NEXT LESSON IS: Estimating Paint

V-1-C-LP

LESSON PLAN

PAINTING AND DECORATING

UNIT:	Surface Preparation
TOPIC:	Estimating Paint
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(E);(e)(4)
TYPE OF LESSON:	Cognitive
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to apply safety principles correctly when preparing walls and will be able to estimate paint accurately.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to estimate paint accurately.

TOOLS AND EQUIPMENT:	Overhead projector, pencil
MATERIALS:	Paper
TEACHING AIDS:	Chalkboard; make transparency from art in information sheet.
REFERENCES:	*Building Trades II* V-1-C-IS V-1-C-AS V-1-C-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

One factor that must be correct is the estimated amount of paint needed to complete a project. After this lesson, you will be able to estimate paint correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using V-1-C-IS as a guide, discuss procedure to estimate paint.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-3-A-IS, III-3-B-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students estimate paint for a room specified by the instructor. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Have students discuss how to estimate paint.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Demonstrate to students how to do an estimate for a room.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use V-1-C-AS and V-1-C-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the procedures used to estimate paint.

THE NEXT LESSON IS: Estimating Paint

LESSON PLAN

PAINTING AND DECORATING

UNIT:	Surface Preparation
TOPIC:	Estimating Paint
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(E);(c)(4)
TYPE OF LESSON:	Cognitive; psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to apply safety principles correctly when preparing walls and will be able to estimate paint accurately.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to estimate paint correctly.

TOOLS AND EQUIPMENT:	Pencil, overhead projector
MATERIALS:	Paper, blueprint
TEACHING AIDS:	Chalkboard, transparency from art in information sheet
REFERENCES:	*Building Trades II* V-1-C-IS V-1-C-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

You must be able to estimate the amount of paint needed to complete a project. Otherwise, the bid or quote you provide to a customer will not be correct. After this lesson, you will be able to estimate paint correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using V-1-C-JS-1 as a guide, complete an estimate for 12' x 12' room.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-3-A-IS, III-3-B-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss how the estimate was completed. Using a current price for paint, have students calculate the cost of painting the 12' x 12' room. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss how estimate was completed and amount of paint needed.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions or problems students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use V-1-C-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding procedures to estimate paint.

THE NEXT LESSON IS: Use of Primers

LESSON PLAN

PAINTING AND DECORATING

UNIT:	Painting
TOPIC:	Use of Primers
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(E);(c)(4)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to apply primers, special paints, and special effects correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to apply primers correctly.
TOOLS AND EQUIPMENT:	Sprayer equipment (air compressor regulator, hoses, paint gun, etc.), flat paddle or shaker, face filter to cover nose and mouth, safety glasses, paint cloths, and covers
MATERIALS:	Primer, thinner or solvent
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* V-2-A-IS V-2-A-AS V-2-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

As previously discussed, there are several methods used to prepare walls and surfaces before they are painted. Primer will assist you in preparing a smooth, long-lasting surface. After this lesson, you will be able to apply primer correctly to prepare surfaces to be painted and use proper safety precautions.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using V-2-A-IS as a guide, discuss the use of primers.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I,* VI-3-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have a paint contractor speak to the class on the use of primers. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss why surfaces need to be primed.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss and demonstrate the use of different types of primers.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use V-2-A-AS and V-2-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the correct application and use of primers.

THE NEXT LESSON IS: Preparation and Prime Coating

LESSON PLAN

PAINTING AND DECORATING

UNIT:	Painting
TOPIC:	Preparation and Prime Coating
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(E);(c)(4)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to apply primers, special paints, and special effects correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to spray and apply primer correctly.

TOOLS AND EQUIPMENT:	Sprayer equipment (air compressor, regulator, hoses, paint gun etc.), flat paddle or shaker, face filter to cover nose and mouth, safety glasses, paint cloths, and covers
MATERIALS:	Primer, thinner or solvent
TEACHING AIDS:	Chalkboard, information in job sheet
REFERENCES:	*Building Trades II* V-2-A-IS V-2-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

There are different methods used to apply paint and primer. After this lesson, you will be able to apply primer with a sprayer.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using V-2-A-JS-1 as a guide, discuss techniques for using a sprayer.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, VI-1-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students disassemble a sprayer, clean, and reassemble it. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss proper procedures when using a sprayer

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions or problems students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use V-2-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the use of different types of sprayers.

THE NEXT LESSON IS: Special Paints

LESSON PLAN

PAINTING AND DECORATING

UNIT:	Painting
TOPIC:	Special Paints
ESSENTIAL ELEMENT(S):	(a)(7)(A,)(C),(E);(e)(4)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to apply primers, special paints, and special effects correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to apply special paints correctly.

TOOLS AND EQUIPMENT:	Textured paint roller, brush, roller pan, paint clothes and covers, flat paddle or shaker, clean container for mixing
MATERIALS:	Paint, water to clean latex paint, or thinner solvent to clean oil-based paint
TEACHING AIDS:	Chalkboard, prepare a display of special paints
REFERENCES:	*Building Trades II* V-2-B-IS V-2-B-AS V-2-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Current trends in the construction industry require the use of various types of special paints. After this lesson, you will be able to use special paints correctly, while using proper safety precautions.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using V-2-B-IS as a guide, discuss use of special paints.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I.* Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Demonstrate to students the different types of special paints; explain the use of heat-resistant paint. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and demonstrate the use of textured paint.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss and demonstrate the use of epoxy paint.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use V-2-B-AS and V-2-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding how special paints are applied.

THE NEXT LESSON IS: Using Roller to Apply Textured Paint

LESSON PLAN

PAINTING AND DECORATING

UNIT:	Painting
TOPIC:	Using Roller to Apply Textured Paint
ESSENTIAL ELEMENT(S):	(a)(7)(A,)(C),(E);(c)(4)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to apply primers, special paints, and special effects correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to apply special paints correctly.

TOOLS AND EQUIPMENT:	Paint cloths and covers, textured paint roller and pan, flat paddle or shaker, clean container for mixing, paint brush
MATERIALS:	Paint, water to clean latex paint, or thinner solvent for oil-based paint clean up
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* V-2-B-IS V-2-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

You have had the opportunity to learn different methods of applying paint. After this lesson, you will apply special types of paint correctly with a roller.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using V-2-B-JS-1 as a guide, review procedures for applying paint.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I,* VI-3-C-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students examine different types of paints and rollers. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss procedures used with latex and oil-based paints.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss the color selection available with textured paints.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use V-2-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding procedures for applying special paints.

THE NEXT LESSON IS: Special Effects

LESSON PLAN

PAINTING AND DECORATING

UNIT:	Painting
TOPIC:	Special Effects
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(E);(c)(4)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to apply primers, special paints, and special effects correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to apply special effects correctly.

TOOLS AND EQUIPMENT:	Coarse-textured paint roller, brush, roller pan, drop cloths, practice wall or board
MATERIALS:	Flat emulsion paint (optional to add tint or color), 1" x 2" x 12" board, 1 pint can black paint
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* V-2-C-IS V-2-C-AS V-2-C-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

The painter needs to be aware of special effects used when painting. After this lesson, you will be able to apply special effects correctly, and use proper safety precautions.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

I. Using V-2-C-IS as a guide, discuss the use of special effects.

CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I,* VI-3-C-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss various ways to use special effects. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss glaze effects.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions or problems students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use V-2-C-AS and V-2-C-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding materials used with glaze and special effects.

THE NEXT LESSON IS: Splattering

LESSON PLAN

PAINTING AND DECORATING

UNIT:	Painting
TOPIC:	Splattering
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(E);(c)(4)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to apply primers, special paints, and special effects correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to apply special effects correctly.

TOOLS AND EQUIPMENT:	Brush, drop cloths, coarse-textured roller, practice wall or board
MATERIALS:	Flat emulsion paint (optional to add tint or color), 1" x 2"x 12" board, 1 pint black paint
TEACHING AIDS:	Chalkboard, job sheets
REFERENCES:	*Building Trades II* V-2-C-IS V-2-C-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

The painter has many choices to use for special effects. After this lesson, you will be able to apply special effects correctly. Use proper safety precautions.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using V-2-C-JS-1 as a guide, review procedures used on job sheets.

CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I,* VI-3-C-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students check different types of paints and special effects used. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Explain procedures used when painting with latex and with oil-based paints.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss the difference between glossy, semigloss, and flat paints.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use V-2-C-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding procedures for splattering paint correctly, and different ways to splatter paint.

THE NEXT LESSON IS: Textures

LESSON PLAN

PAINTING AND DECORATING

UNIT: Wall Finish Techniques

TOPIC: Textures

ESSENTIAL ELEMENT(S): (a)(7)(A),(C),(E);(e)(4)

TYPE OF LESSON: Psychomotor

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to apply textures and wallcovering correctly, and estimate their cost accurately.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to apply different types of texture correctly.

TOOLS AND EQUIPMENT: Spreader for adhesive, flat brush, 12′ tape measure, utility knife or scissors

MATERIALS: Wall adhesive, straw sheeting to cover panel or wall

TEACHING AIDS: Chalkboard

REFERENCES: *Building Trades II*

V-3-A-IS
V-3-A-AS
V-3-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

You have had the opportunity to use different methods to apply textures. After this lesson, you will be able to use the different types of texture correctly. Use proper safety precautions

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TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using V-3-A-IS as a guide, discuss the different textures available.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, VI-3-C-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss the different types of materials used to texture walls. Have students discuss the use of burlap walls. Have students suggest different types of materials that could be used to texture walls. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Have students explain the purpose of texture.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss why a rough texture would be used.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use V-3-A-AS and V-3-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the techniques for texturing walls.

THE NEXT LESSON IS: Applying Straw Sheething

V-3-A-LP-1

LESSON PLAN

PAINTING AND DECORATING

UNIT:	Wall Finish Techniques
TOPIC:	Applying Straw Sheeting
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(E);(e)(4)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to apply textures and wallcovering correctly, and estimate their cost accurately.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to apply different types of texture correctly.

TOOLS AND EQUIPMENT:	Tape measure, spreader for adhesive, utility knife or scissors, flat brush
MATERIALS:	Wall adhesive, straw sheeting to cover panel or wall
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* V-3-A-IS V-3-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

There are many types of textures and wall coverings. After this lesson, you will be able to apply wall coverings correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using V-3-A-JS-1 as a guide, discuss techniques used to apply straw sheeting.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, VI-3-C-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have a contractor come to discuss procedures for applying different types of wall coverings. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Demonstrate the use of different textures and wall coverings.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions or problems students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use V-3-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding procedures used to apply wallcoverings.

THE NEXT LESSON IS: Wallcoverings

LESSON PLAN

PAINTING AND DECORATING

UNIT:	Wall Finish Techniques
TOPIC:	Wallcoverings
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(E);(c)(4)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to apply textures and wallcovering correctly, and estimate their cost accurately.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to apply wallcoverings correctly.

TOOLS AND EQUIPMENT:	Tape measure, sharp utility knife
MATERIALS:	Panel adhesive, 32 pieces of 12" square cork panels
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* V-3-B-IS V-3-B-AS V-3-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

You have had the opportunity to work with wallcoverings. After this lesson, you will be able to apply wallcoverings correctly. Use proper safety precautions.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using V-3-B-IS as a guide, discuss types of wallcoverings.

CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I.* Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss the different types of materials used with wallcoverings. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the use of grasscloth as a wallcovering.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss the use of cork as a wallcovering.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use V-3-B-AS and V-3-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the procedures used to install wallcovering.

THE NEXT LESSON IS: Installing Cork on Wall

LESSON PLAN

PAINTING AND DECORATING

UNIT:	Wall Finish Techniques
TOPIC:	Installing Cork on Wall
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(E);(e)(4)
TYPE OF LESSON:	Cognitive; psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to apply textures and wallcoverings correctly, and estimate their cost accurately.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to apply wallcoverings correctly.

TOOLS AND EQUIPMENT:	Tape measure, sharp utility knife
MATERIALS:	Panel adhesive, 32 pieces of 12" inch square cork panels
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* V-3-B-IS V-3-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Cork wallcovering is easy to apply. After completing this lesson, you will be able to apply cork wallcovering correctly. Use proper safety precautions.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using V-3-B-JS-1 as a guide, install cork wallcovering.

   CHECK FOR KNOWLEDGE: Review information in *Building Trades I*. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students explain how to install this type of wallcovering. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and demonstrate the procedure used to apply cork panels on walls.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions or problems students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use V-3-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the procedure used to apply cork wallcovering.

THE NEXT LESSON IS: Estimating

LESSON PLAN

PAINTING AND DECORATING

UNIT:	Wall Finish Techniques
TOPIC:	Estimating
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(E);(e)(4)
TYPE OF LESSON:	Cognitive
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to apply textures and wallcoverings correctly, and estimate their cost accurately.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to estimate wall finish correctly.

TOOLS AND EQUIPMENT:	Overhead projector, 12" ruler or scale
MATERIALS:	Paper, pencil
TEACHING AIDS:	Chalkboard; make transparencies from art in information sheet.
REFERENCES:	*Building Trades II* V-3-C-IS V-3-C-AS V-3-C-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Estimating wall finish may be complex at times, but it is necessary. After this lesson, you will be able to estimate wall finish techniques correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using V-3-C-IS as a guide, discuss the need for correct estimating.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I,* III-3-B-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss the procedure used to estimate wall finish. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and demonstrate how estimates are prepared.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions or problems students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use V-3-C-AS and V-3-C-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the formula used to prepare an estimate.

THE NEXT LESSON IS: Estimating Wallcovering

LESSON PLAN

PAINTING AND DECORATING

UNIT:	Wall Finish Techniques
TOPIC:	Estimating Wallcovering
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(E);(e)(4)
TYPE OF LESSON:	Cognitive; psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to apply textures and wallcoverings correctly, and estimate their cost accurately.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to identify and state the purpose of estimating wall finish correctly.

TOOLS AND EQUIPMENT:	12" ruler or scale
MATERIALS:	Paper, pencil
TEACHING AIDS:	Chalkboard, transparency
REFERENCES:	*Building Trades II* V-3-C-IS V-3-C-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Estimating wallcoverings may be complex at times, but it is necessary. After this lesson, you will be able to correctly estimate wallcoverings.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using V-3-C-JS-1 as a guide, estimate task provided.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I.* Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students explain the procedure used to estimate wallcoverings. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and demonstrate the procedure for preparing estimates for wallcovering.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any problems.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use V-3-C-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the use of estimates.

THE NEXT LESSON IS: Next unit is Plumbing

LESSON PLAN

PLUMBING

UNIT:	Plumbing Tools and Materials
TOPIC:	Plumbing Tools
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(5)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to use plumbing tools and materials when correctly installing plumbing fixtures.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to use plumbing tools correctly.

TOOLS AND EQUIPMENT:	Overhead projector, chisel, hammer, 12′ steel tape, grease pencil, 2" x 4" x 6" board
MATERIALS:	Two-foot section of heavy cast-iron pipe
TEACHING AIDS:	Chalkboard; make transparencies from art in information sheet.
REFERENCES:	*Building Trades II* VI-1-A-IS VI-1-A-AS VI-1-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Plumbers must be able to identify the tools they use and know how to care for them. After this lesson, you will be able to use plumbing tools correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using VI-1-A-IS as a guide, review and discuss tools used.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I,* VII-1-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Set up a display and have students identify plumbing tools. Have students explain how tools are used. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

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2. Discuss the use and care of plumbing tools.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Pick tools at random, and have students identify and explain use of each tool.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use VI-1-A-AS and VI-1-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the use and care of plumbing tools.

THE NEXT LESSON IS: Cutting a Soil Pipe

LESSON PLAN

PLUMBING

UNIT:	Plumbing Tools and Materials
TOPIC:	Cutting a Soil Pipe
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(5)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to use plumbing tools and materials when correctly installing plumbing fixtures.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to cut soil pipe correctly.

TOOLS AND EQUIPMENT:	Chisel, hammer, grease pencil, 12′ steel tape, 2" x 4" x 6" board
MATERIALS:	Two-foot section of heavy cast-iron pipe
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* VI-1-A-IS VI-1-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Often, cutting tools are not available to plumbers. After this task, you will be able to cut soil pipe correctly using a chisel. Use proper safety precautions.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using VI-1-A-JS-1 as a guide, show how soil pipe is cut.

CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I.* Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students show how soil pipe can be cut. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and demonstrate how pipe can be cut with a chisel.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions or problems students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use VI-1-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the different methods used for cutting pipes.

THE NEXT LESSON IS: Plumbing Materials

VI-1-B-LP

LESSON PLAN

PLUMBING

UNIT: Plumbing Tools and Materials

TOPIC: Plumbing Materials

ESSENTIAL ELEMENT(S): (a)(7)(A),(C),(D),(E);(e)(5)

TYPE OF LESSON: Psychomotor

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to use plumbing tools and materials when correctly installing plumbing fixtures.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to use plumbing materials correctly.

TOOLS AND EQUIPMENT: Overhead projector, pipe threader, union, pipe cutter, vise, oil, 2 pipe wrenches, folding ruler

MATERIALS: Length of steel pipe (1/2- or 3/4-inch diameter), pipe sealer

TEACHING AIDS: Chalkboard; make transparencies from art in information sheet.

REFERENCES: *Building Trades II*
VI-1-B-IS
VI-1-B-AS
VI-1-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

There are many different materials used in plumbing. After this lesson, you will be able to use these materials correctly. Use proper safety precautions.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using VI-1-B-IS as a guide, identify and discuss the use of plumbing materials.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I,* VII-1-B-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Set up a display of materials, and have students label materials. Have students explain how materials are used. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss why correct identification of materials is important.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Randomly call upon students to identify and describe the use of various plumbing materials.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use VI-1-B-AS and VI-1-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding plumbing materials and their use.

THE NEXT LESSON IS: Union Installation

LESSON PLAN

PLUMBING

UNIT:	Plumbing Tools and Materials
TOPIC:	Union Installation
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(5)
TYPE OF LESSON:	Cognitive; psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to use plumbing tools and materials when correctly installing plumbing fixtures.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to install unions correctly.

TOOLS AND EQUIPMENT:	Pipe threader, union, pipe cutter, vise, oil, 2 pipe wrenches, folding ruler
MATERIALS:	Length of steel pipe (1/2- or 3/4-inch diameter), pipe sealer
TEACHING AIDS:	Overhead projector; chalkboard
REFERENCES:	*Building Trades II* VI-1-B-IS VI-1-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

You have had the opportunity to learn about plumbing materials. After this lesson, you will be able to install unions correctly. Use proper safety precautions.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using VI-1-B-JS-1 as a guide, review how a union is installed.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, III-2-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students explain how task was done. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the purpose of unions.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Demonstrate how to install unions.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use VI-1-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the purpose and proper installation of unions.

THE NEXT LESSON IS: Plumbing Fixtures

LESSON PLAN

PLUMBING

UNIT: Plumbing Tools and Materials

TOPIC: Plumbing Fixtures

ESSENTIAL ELEMENT(S): (a)(7)(A),(C),(D),(E);(e)(5)

TYPE OF LESSON: Psychomotor

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to use plumbing tools and materials when correctly installing plumbing fixtures.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to install plumbing fixtures correctly.

TOOLS AND EQUIPMENT: Air-acetylene torch, striker, gas tank, tank wrench, solder, flux, sand cloth, adjustable wrench, flaring tool and block, flare nut wrench, level, screwdrivers, 1/2" tubing cutter, 6' rule or steel tape, plumber's socket wrench set, valve seat wrench, knife, handle puller

MATERIALS: Dishwasher, 1 1/2" tubing, 1/2" tubing, fitting and valves, dishwasher adapter sink tail piece, clean cloths, pipe compound, stem grease, valve seat (new), washer (new)

TEACHING AIDS: Chalkboard

REFERENCES: *Building Trades II*

VI-1-C-IS
VI-1-C-AS
VI-1-C-JS-1
VI-1-C-JS-2

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Installing plumbing fixtures is the responsibility of the plumber. After this lesson, you will be able to install plumbing fixtures correctly. Use proper safety precautions.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using VI-1-C-IS as a guide, discuss the importance of plumbing fixtures.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, VII-1-C-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

EXTENSION ACTIVITIES: Extend the learning for the student(s). Provide the students with information on how to install plumbing fixtures. Have students demonstrate how to change washers in faucets. In addition you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the different types of bathroom lavatories.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions or problems that students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use VI-1-C-AS, VI-1-C-JS-1, and VI-1-C-JS-2 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the use of plumbing fixtures and how they are installed.

THE NEXT LESSON IS: Install a Dishwasher

LESSON PLAN

PLUMBING

UNIT:	Plumbing Tools and Materials
TOPIC:	Install A Dishwasher
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(5)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to use plumbing tools and materials when correctly installing plumbing fixtures.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to install a dishwasher correctly.

TOOLS AND EQUIPMENT:	Air-acetylene torch, striker, gas tank, tank wrench, solder, flux, sand cloth, adjustable wrench, flaring tool and block, flare nut wrench, level, screwdriver, 1/2" tubing cutter, 6' rule or steel tape
MATERIALS:	Dishwasher, 1 1/2" tubing, 1/2" tubing, fittings and valves, dishwasher adapter sink tail piece, clean cloth
TEACHING AIDS:	Chalkboard, blueprint
REFERENCES:	*Building Trades II* VI-1-C-IS VI-1-C-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Installing plumbing fixtures is the responsibility of the plumber. After this lesson, you will be able to install a dishwasher correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using VI-1-C-JS-1 as a guide, discuss the procedure for installing a dishwasher correctly.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, VII-1-C-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Provide the students with information on how to install plumbing fixtures. Have students discuss and explain information on installing a dishwasher. In addition you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the different types of dishwasher installation.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions or problems that students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use VI-1-C-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding how plumbing fixtures are installed correctly.

THE NEXT LESSON IS: Repair a Shower Valve

LESSON PLAN

PLUMBING

UNIT:	Plumbing Tools and Materials
TOPIC:	Repair a Shower Valve
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(5)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to use plumbing tools and materials when correctly installing plumbing fixtures.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to repair a shower valve correctly.

TOOLS AND EQUIPMENT:	Adjustable wrench, screwdrivers, plumbe'rs socket wrench set, valve seat wrench, knife, handle puller
MATERIALS:	Pipe compound, clean cloth, stem grease, valve seat (new), washer (new)
TEACHING AIDS:	Chalkboard, job sheet
REFERENCES:	*Building Trades II* VI-1-C-IS VI-1-C-JS-2

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Repairing plumbing fixtures is the plumber's responsibility. After this lesson, you will be able to repair a shoower valve correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using VI-1-C-JS-2 as a guide, review and discuss information.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, VII-1-C-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students observe and explain how to repair shower valves. In addition you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss procedures used to repair shower valves correctly.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions or problems that students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use VI-1-C-JS-2 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding proper procedures to repair shower valves and other types of valves.

THE NEXT LESSON IS: Symbols and Sketches

LESSON PLAN

PLUMBING

UNIT:	Fundamentals of Plumbing
TOPIC:	Symbols and Sketches
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(5)
TYPE OF LESSON:	Cognitive
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to interpret symbols and sketches correctly when repairing drainage and water systems.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to read and interpret plumbing symbols and sketches correctly.

TOOLS AND EQUIPMENT:	Overhead projector, drawing board, 45° triangle (8" sides), 30° x 60° triangle (10" sides), pencil, eraser, pencil sharpener, architect's scale
MATERIALS:	Paper or appropriate material, drawing provided in job sheet
TEACHING AIDS:	Chalkboard; make transparencies from art in information sheet.
REFERENCES:	*Building Trades II* VI-2-A-IS VI-2-A-AS VI-2-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

It is important that plumbers be able to read and interpret symbols in order to understand sketches made from blueprints. After this lesson, you will be able to use plumbing symbols and make sketches correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using VI-2-A-IS as a guide, discuss the importance of plumbing symbols.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I,* VII-2-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss plumbing symbols and explain their purpose. Have students make a chart and label symbols. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and explain how plumbing symbols are used and when to use them.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Randomly call upon students to interpret various symbols.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use VI-2-A-AS and VI-2-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the use of sketches and plumbing symbols.

THE NEXT LESSON IS: Isometric Sketching

LESSON PLAN

PLUMBING

UNIT:	Fundamentals of Plumbing
TOPIC:	Isometric Sketching
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(5)
TYPE OF LESSON:	Cognitive; psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to interpret symbols and sketches correctly when repairing drainage and water systems.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to read and interpret plumbing symbols and sketches correctly.

TOOLS AND EQUIPMENT:	Drawing board, 45° triangle (8" sides), 30° x 60° triangle (10" sides), pencil, eraser, pencil sharpener, architect's scale
MATERIALS:	Paper or appropriate material, drawing provided with job sheet
TEACHING AIDS:	Chalkboard, blueprints
REFERENCES:	*Building Trades II* VI-2-A-IS VI-2-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

It is important that plumbers be able to read, interpret, and make isometric sketches. After this lesson, you will be able to use plumbing symbols and make sketches correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using VI-2-A-JS-1 as a guide, discuss sketching procedures to use.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, VII-2-A-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students discuss proper ways to make isometric sketches. Have students make a chart and label symbols. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the importance of making isometric sketches.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Randomly call upon students to interpret an isometric sketch.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use VI-2-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding how students would interpret different types of sketches and blueprints.

THE NEXT LESSON IS: Drainage System Repair

LESSON PLAN

PLUMBING

UNIT:	Fundamentals of Plumbing
TOPIC:	Drainage System Repair
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(5)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to interpret symbols and sketches correctly when repairing drainage and water systems.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to repair drainage systems correctly.

TOOLS AND EQUIPMENT:	Overhead projector, water closet connected to the drain system, vacuum plunger, closet auger, bucket, clean cloth
MATERIALS:	Roll of toilet tissue
TEACHING AIDS:	Chalkboard; make transparencies from art in information sheet.
REFERENCES:	*Building Trades II* VI-2-B-IS VI-2-B-AS VI-2-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

All residential plumbing systems require vent systems for drainage and waste. After this lesson, you will be able to repair drainage systems correctly. Use proper safety precautions.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using VI-2-B-IS as a guide, discuss drainage systems.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I,* VII-2-B-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have a plumbing contractor speak to the class regarding drainage repair. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Explain why the drainage system is not installed in the same trench with the water line.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss the use of a vent system.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use VI-2-B-AS and VI-2-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding procedures for installing drain, waste, and vent systems.

THE NEXT LESSON IS: Clear Stoppage from a Water Closet Drain

LESSON PLAN

PLUMBING

UNIT:	Fundamentals of Plumbing
TOPIC:	Clear Stoppage from a Water Closet Drain
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(e)(5)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to interpret symbols and sketches when correctly repairing drainage and water systems.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to repair a water closet drain correctly.

TOOLS AND EQUIPMENT:	Water closet connected to the drain system, vacuum plunger, closet auger, bucket, clean cloth
MATERIALS:	Roll of toilet tissue
TEACHING AIDS:	Chalkboard; overhead projector, transparency
REFERENCES:	*Building Trades II* VI-2-B-IS VI-2-B-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

All residential plumbing systems require maintenance for drainage systems. After this lesson, you will be able to repair drainage systems correctly. Use proper safety precautions.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using VI-2-B-JS-1 as a guide, discuss procedures used for clearing stoppage from a water closet drain.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I,* VII-2-B-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students visit a worksite or project to observe how a water closet blockage is cleared. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss the use of a closet auger.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss any questions or problems students may have.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use VI-2-B-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the repair of plumbing fixtures and drainage systems.

THE NEXT LESSON IS: Water System Repair

LESSON PLAN

PLUMBING

UNIT:	Fundamentals of Plumbing
TOPIC:	Water System Repair
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(c)(5)
TYPE OF LESSON:	Psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to interpret symbols and sketches correctly when repairing drainage and water systems.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to repair water systems correctly.

TOOLS AND EQUIPMENT:	Hacksaw, rag or shop towel, utility knife
MATERIALS:	3/4" section of 8' long PVC pipe, two 3/4" couplings, PVC cleaner, PVC glue
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* VI-2-C-IS VI-2-C-AS VI-2-C-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

Plumbers need to be able to repair water systems, as well as installing new systems. After this lesson, you will be able to repair water systems correctly. Use proper safety precautions.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

I. Using VI-2-C-IS as a guide, discuss how water systems are repaired.

CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, VII-2-C-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

EXTENSION ACTIVITIES: Extend the learning for the student(s). Arrange field trips to a building site to observe a water system being installed. Have students explain the procedure used to repair a leak in a section of pipe. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and demonstrate the procedure for repairing a water line with pressure on.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss and demonstrate the procedure for a repairing a water line with mineral buildup in the line.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use VI-2-C-AS and VI-2-C-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the repair of a water system.

THE NEXT LESSON IS: Replacing Cracked-Line Section PVC

LESSON PLAN

PLUMBING

UNIT: Fundamentals of Plumbing

TOPIC: Replacing Cracked-Line Section PVC

ESSENTIAL ELEMENT(S): (a)(7)(A),(C),(D),(E);(e)(5)

TYPE OF LESSON: Cognitive; psychomotor

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to interpret symbols and sketches correctly when repairing drainage and water systems.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to repair a cracked-line section PVC correctly.

TOOLS AND EQUIPMENT: Hacksaw, rag or shop towel, utility knife

MATERIALS: 3/4" section of 8′ long PVC pipe; two 3/4" couplings; PVC cleaner; PVC glue

TEACHING AIDS: Chalkboard

REFERENCES: *Building Trades II*
VI-2-C-IS
VI-2-C-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

The plumber should be able to repair lines under different working conditions. After this lesson, you will be able to repair PVC lines correctly. Use proper safety precautions.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using VI-2-C-JS-1 as a guide, repair line described in task.

CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I.* Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students explain the correct procedure used to repair PVC water lines. Have students explain how a line should be repaired with pressure on. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and demonstrate how to repair PVC water systems.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss and demonstrate the proper use of PVC cleaner and glue.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use VI-2-C-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the repair of PVC water systems.

THE NEXT LESSON IS: Installing Gas Water Heater

LESSON PLAN

PLUMBING

UNIT: Plumbing Installation

TOPIC: Installing Gas Water Heater

ESSENTIAL ELEMENT(S): (a)(7)(A),(C),(D),(E);(e)(5)

TYPE OF LESSON: Psychomotor

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install gas water heaters correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to install gas water heaters correctly.

TOOLS AND EQUIPMENT: Plastic bottle, adjustable wrench, can or plastic container, tube cutter with a reamer, air-acetylene torch, striker, tank wrench

MATERIALS: Soap, water, solder, flux, sand cloth, tubing, pipe compound, fittings as needed, relief valve, water heater, two 3/4" male adapters, one 3/4" gate valve

TEACHING AIDS: Chalkboard

REFERENCES: *Building Trades II*

VI-3-A-IS
VI-3-A-AS
VI-3-A-JS-1
VI-3-A-JS-2

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

A plumber must install plumbing fixtures and be familiar with the correct procedures for installation. Installing a gas water heater can be extremely dangerous if not done correctly. After this lesson, you will be able to install a gas water heater correctly. Use proper safety precautions.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using VI-3-A-IS as a guide, discuss the correct procedures for installing a gas water heater.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*, VII-1-C-IS. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Arrange for a field trip to a worksite to observe the correct procedure for installing a gas water heater. Have students discuss procedures used by the plumber. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and demonstrate correct procedures for installing gas water heaters. Emphasize the importance of practicing safety standards when installing gas water heaters.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss why proper maintenance is important with plumbing fixtures, especially gas water heaters.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use VI-3-A-AS, VI-3-A-JS-1, and VI-3-A-JS-2 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the installation of different plumbing fixtures.

THE NEXT LESSON IS: Checking for Gas Leaks

LESSON PLAN

PLUMBING

UNIT:	Plumbing Installation
TOPIC:	Checking for Gas Leaks
ESSENTIAL ELEMENT(S):	(a)(7)(A),(C),(D),(E);(c)(5)
TYPE OF LESSON:	Cognitive; psychomotor
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install gas water heaters correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to check for gas leaks correctly and safely.

TOOLS AND EQUIPMENT:	Plastic bottle, adjustable wrench, can or plastic container
MATERIALS:	Soap, water
TEACHING AIDS:	Chalkboard
REFERENCES:	*Building Trades II* VI-3-A-IS VI-3-A-JS-1

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

The plumber has to be aware of how to check for gas leaks safely . After this lesson, you will be able to check for gas leaks correctly. Use proper safety precautions.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using VI-3-A-JS-1 as a guide, discuss the procedure to check for leaks.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I*. Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Have students demonstrate how to check for gas leaks. Discuss with students what to do when a leak is found. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Demonstrate the correct procedure for checking for gas leaks.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Have students mix soap solution and check for gas leaks.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use VI-3-A-JS-1 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding safety procedures when checking for gas leaks.

THE NEXT LESSON IS: Install An Electric Water Heater

LESSON PLAN

PLUMBING

UNIT: Plumbing Installation

TOPIC: Install An Electric Water Heater

ESSENTIAL ELEMENT(S): (a)(7)(A),(C),(D),(E);(c)(5)

TYPE OF LESSON: Psychomotor

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install water heaters correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to install an electric water heater correctly.

TOOLS AND EQUIPMENT: Tube cutter with a reamer, air-acetylene torch, striker, tank wrench, adjustable wrench

MATERIALS: Solder, flux, sand cloth, tubing, pipe compound, fittings as needed, relief valve, water heater, two 3/4" male adapters, one 3/4" gate valve

TEACHING AIDS: Chalkboard

REFERENCES: *Building Trades II*
VI-3-A-IS
VI-3-A-JS-2

INTRODUCTION/MOTIVATION/WARM-UP (FOCUS/DIRECT STUDENT'S ATTENTION TO THE CONTENT/PURPOSE OF INSTRUCTION/ACTIVITY)

A plumber installs plumbing fixtures and must be familiar with the correct procedures for installation. Installing an electric water heater can be dangerous if not done correctly. After this lesson, you will be able to install an electric water heater correctly.

TEACHER ACTIVITIES (PRESENTATION, DEMONSTRATION, LECTURE, MODELING, AUDIO/VISUALS, CHECK FOR KNOWLEDGE, AND RETEACH/EXTENSION)

1. Using VI-3-A-JS-2 as a guide, discuss correct procedure for installing an electric water heater.

   CHECK FOR KNOWLEDGE: Review information covered in *Building Trades I.* Make sure the students are following or comprehending what is being presented. If the students are not perceiving the subject matter, then use reteach activities. If the students are perceiving the subject matter, then use extension activities.

   RETEACH ACTIVITIES: Teach the same material by using either different methods or employing the technique of individualized instruction.

   EXTENSION ACTIVITIES: Extend the learning for the student(s). Arrange for a field trip to a worksite to observe the correct procedures for installing an electric water heater. In addition, you may choose to continue to the next subtopic or use related magazines, books, pictures, computer software, videos, etc.

2. Discuss and demonstrate the correct procedures for instsalling an electric water heater safely.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

3. Discuss why proper maintenance is important with plumbing fixtures, especially water heaters.

   CHECK FOR KNOWLEDGE

   RETEACH ACTIVITIES

   EXTENSION ACTIVITIES

4. Discuss the information provided. Ask questions requiring individual and group responses to check for knowledge.

STUDENT ACTIVITIES (APPLICATION)

Use VI-3-A-JS-2 as independent practice.

EVALUATION/VERIFICATION

An informal evaluation of student learning may be done through scoring of assignment sheets and by observing students as they complete job sheets.

SUMMARY/CLOSURE

Review information provided. Ask questions regarding the installation of different plumbing fixtures.

APPENDICES

APPENDIX A

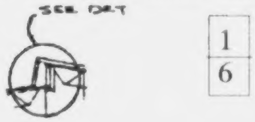
ANSWERS TO ASSIGNMENT SHEETS

ANSWERS TO ASSIGNMENT SHEETS

SECTION II - CARPENTRY

II-1-A-AS

1. working drawings
2. stairs, walls, bracing
3. to show detail parts of a drawing
4. to show specific dimensions clearly
5. transverse
6. longitudinal
7. unusual or special
8. windows, cornice, doors
9. to clarify manner construction is done
10.



II-1-B-AS

1. plumbers, architects, engineers
2. piping is not on most residence plans
3. grid paper
4. location of symbols and fixtures
5. for communication purposes

II-2-A-AS

1. ground level
2. where frost penetration is no problem
3. a monolithic slab
4. to keep soil from shifting or settling and cracking the slab
5. in areas such as fireplaces
6. undisturbed earth
7. footings
8. steel reinforcement rods and welded wire fabric
9. 82.5 board feet
10. 10,500 hours of labor

II-2-B-AS

1. longest
2. both sides
3. chalkline
4. 45° angle
5. 3/4 inch
6. 8d
7. in corner
8. side-by-side
9. tongue-and-groove
10. 6 inch
11. 1,040 square feet
12. 2,070 square feet

II-2-C-AS

1. interior plywood
2. to prevent warpage and shrinkage
3. with the tongue to the outside
4. take a piece of 2" x 4", lay it against the groove side and hit to set it
5. across the main beams
6. 8d common ring shank or helically threaded nails
7. every 6" on center
8. to drive the head at least 1/8 inch below the wood surface
9. because of the smooth surface it provides
10. all of the cracks would need to be filled and sanded smooth

II-3-A-AS

1. horizontal
2. rise
3. riser
4. stringers and carriages
5. landing
6. winders
7. handrail
8. balustrade
9. newel post
10. instructor's satisfaction
11. 36 1/4 inches
12. 16 board feet
13. 2 board feet
14. 31 1/2 inches

II-3-B-AS

1. both
2. balustrade
3. secured or anchored
4. mortise
5. two or three
6. rails

II-3-C-AS

1. through sections and details
2. to be sure stairway will fit after construction has begun
3. total rise = height of a riser x number of risers, or number of risers = $\frac{\textit{total rise}}{\textit{height of riser}}$
4. total run = width of a tread x number of treads, or number of treads = $\frac{\textit{total run}}{\textit{width of a tread}}$
5. code
6. well opening = $\frac{\textit{tread width}}{\textit{riser height}} \times R$; R equals required headroom

II-3-D-AS

1. the riser and run is same as carriage but in reverse
2. to keep the stringers from breaking and exposing the thread joints
3. TM4
4. TM4
5. TM4, a
6. after completing 3,4,5 give to instructor to evaluate

II-4-A-AS

1. the carpenter and is made from 1" x 4" or 2" x 4"
2. the actual wall frame
3. all the horizontal parts
4. it saves time and there is less chance for a mistake
5. to assure the measurements are accurate
6. residential construction
7. split level construction
8. instructor's satisfaction

II-4-B-AS

1. the bearing partitions
2. the ceiling and roof
3. the outside walls
4. after the roof is complete
5. the plans and chalkline
6. the longest section
7. 30 board feet
8. 6 pieces
9. 21 braces
10. 1,440 hours

II-4-C-AS

1. they are non-bearing partitions
2. using trimmers
3. is removed with handsaw
4. 2 1/2 inches
5. they are not walls that carry a load

II-4-D-AS

1. for easy assembly
2. for strength and not to have splices
3. with power screwdrivers and self tapping screws
4. 2 foot spacing
5. through insulated grommets installed in stud webs
6. batt insulation

II-5-A-AS

1. the French and casement doors
2. insulated glass is being used
3. with tempered safety glass
4. L is for left-hand opening, R is for right-hand opening
5. rough opening
6. a sealing compound should be laid across the opening
7. they should be plumbed and wedges installed
8. mark glass panels so they can be seen

II-5-B-AS

1. T
2. F
3. F
4. T
5. T
6. F
7. T
8. F
9. T
10. T

II-5-C-AS

1. the manufacturer
2. in a clean, dry area if possible
3. for damage while being shipped
4. 1/2 inch on sides and 3/4 inch at top
5. to prevent air infiltration
6. secure enough help to set the window
7. to level and square the window
8. place wedge blocks along window in several places
9. the framing square
10. galvanized or aluminum nails
11. 8 windows

II-6-A-AS

1. T
2. F
3. T
4. F
5. F
6. T
7. F
8. T
9. T
10. F

II-6-B-AS

1. when it is installed in a permanent way
2. adjustable shelves
3. to keep items from being torn or broken
4. a fixed shelf cannot be adjusted after it is installed
5. pine, oak, cherry, pecan, mahogany, pressed panels
6. 20 board feet

II-6-C-AS

1. ability to overcome foot traffic, and be stain resistant
2. measure the room
3. the floor should be clean and all the cracks filled and smooth
4. has a head with adjustable needles for gripping the carpet and a padded extension for applying pressure
5. it has a telescopic tubular arrangement connected to a lever to apply pressure to the carpet and stretch
6. to stretch the carpet and hook it on tack strips
7. to hold the carpet tight when stretched around the room
8. an awl
9. measure from wall to pipe and fold carpet over, mark with chalk, then cut and lay around pipe; use tape under cut and press down to floor
10. it has a thin blade with a curved, pointed, steel tip used for cutting carpet

II-6-D-AS

1. F
2. F
3. T
4. T
5. T
6. F
7. T
8. T
9. T
10. F

II-6-E-AS

1. breaker panel
2. dimmer
3. tracking
4. any
5. fluorescent
6. 7500
7. warm white
8. 9
9. 18
10. 5,000

II-7-A-AS

1. T
2. F
3. F
4. T
5. F
6. T
7. T
8. F
9. F
10. T
11. 3,000 shingles
12. $164.80

II-7-B-AS

1. F
2. T
3. T
4. T
5. F
6. T
7. T
8. T
9. F
10. F
11. 68 sheets

II-7-C-AS

1. balloon type framing
2. caused by joint shrinkage
3. wood sheathing, sheathing paper, metal lath
4. galvanized nails
5. 3/4 inch
6. balloon framing, platform framing

II-7-D-AS

1. molding
2. drip edge
3. fascia
4. cornice
5. rough fascias
6. eight
7. rake
8. lookout
9. soffit
10. protect
11. $4,950.00

II-7-E-AS

1. eave trough
2. downspout
3. red cedar, fir
4. away from foundation
5. metal
6. fascia
7. metal
8. expensive

ANSWERS TO ASSIGNMENT SHEETS

SECTION III - MASONRY

III-1-A-AS Evaluated to the satisfaction of instructor.

III-1-B-AS

1. brick, stone, marble
2. tile setters, plasterers, terrazzo workers, and concrete masons
3. one out of every three are self-employed
4. small jobs like patios, walks, fireplaces
5. age 17
6. someone who has completed their apprenticeship in the trade
7. T
8. F
9. T
10. T
11. 1,080
12. $200.00

III-2-A-AS Description evaluated to the satisfaction of the instructor.

1. F
2. G
3. D
4. C
5. H
6. E
7. A
8. B
9. I

III-2-B-AS

1. electricity or gasoline engine
2. smooth, dense finish
3. a screed
4. is made from straight pieces of wood or metal with an electric or gasoline motor mounted on it
5. a hydraulic lift
6. 14%
7. $24.00

III-3-A-AS

1. it causes mortar to dry out
2. to keep from drying out
3. it bonds units together, makes up difference in size, provides bonding for metal and other reinforcing materials, it provides a nice look and quality by creating pleasing lines and color effects
4. plastic, hardened
5. plastic mortar is workable, uniform, cohesive, and of a consistency that makes it useable
6. the mortar increases as the cement content is increased
7. ability to prevent loss of mixing water to be absorbed into masonry on hot days
8. the durability of mortar
9. 23 1/2 cubic yards of mortar
10. 24,714 total weight

III-3-B-AS

1. bond stones
2. frequently as possible
3. 18 inches
4. reinforcing
5. it passes through the wall from side to side
6. mortar will be brittle
7. hydrated lime
8. type N mortar
9. because of hardness and denseness
10. washed building sand

III-3-C-AS

1. a stiff fiber brush and clean water
2. use soapy water then rinse with clear water
3. machine cleaning process
4. any acid compounds
5. acids, wire brushes, sandblasting
6. to clean by sponging during construction
7. cover wall with plastic or canvas
8. 1 part acid to 10 parts water
9. $103.00 profit
10. 8.74 or 8.65 cubic yards

III-4-A-AS

1. support the weight of the building above, resist pressure from the ground, provide anchorage for the building's superstructure
2. capped with a solid cap of masonry, to serve as a termite barrier
3. to instructor's satisfaction

4. the T foundation wall
5. masonry cap on top of the wall
6. with polyethylene sheeting
7. 975 square feet
8. 8,160 square feet
9. cement - 5 cubic feet
   gravel - 5 cubic feet
   sand - 5 cubic feet
10. 1,440 hours

III-4-B-AS

1. it should be parged with a 1/2-inch thick coat of portland cement, plaster or mortar
2. minimum of 24 hours
3. you should form a cove
4. in addition to the parge coat, a heavy coat of tar, two coats of cement base paint, or thin plastic film
5. at least 48 hours
6. heavy coat of tar, two coats cement base paint, or thin plastic film
7. a grout coating
8. 3/4 portland cement, 1 part sand, 1/4 fine hydrated lime
9. always wet the area being grouted
10. there should be two coats applied

III-4-C-AS

1. to provide a continuous air space
2. the airspace provides an insulation value and can be filled with insulation material for added reduction of heat transfer, and it acts as a barrier to moisture
3. flashing should be used
4. to be an effective use for insulating purposes
5. with rigid metal ties
6. to keep any moisture which might collect from the inner wall
7. they are applied by spraying or brushing
8. a solvent type and a water-based type
9. the solvent will penetrate the best
10. it will penetrate 1/8" to 1/4"

III-4-D-AS

1. expansion cracks
2. caulking compound
3. expansion cracks
4. 12 months

5. vertical
6. settlement
7. 1,175 lineal feet
8. 180 feet
9. 1/4 gallon
10. $2.50 each

III-5-A-AS

1. the size, shape, location, and specifications
2. the meanings of lines, symbols, abbreviations, and notes
3. instructor's satisfaction
4. an edge or an intersection of two surfaces not visible
5. they are used to show where a dimension line ends
6. are used to show that all of the part is not shown
7. are very thin lines used to show the feature has been sectioned
8. they are very thin lines used in lettering
9. they are also very thin lines used in the making of a drawing
10. symbols and abbreviations

III-5-B-AS

1. at 1/4" = 1'- 0" scale
2. size means inch to inch
3. scale means inches to feet
4. to 1' - 0"
5. 1 7/8

III-5-C-AS

1. specs
2. construction document
3. general conditions, and technical sections
4. they deal with terms of agreement, insurance, responsibility for permits, supervisors, payment for work, temporary utilities
5. they deal with the technical sections

ANSWERS TO ASSIGNMENT SHEETS

SECTION IV - RESIDENTIAL ELECTRICIAN

IV-1-A-AS

1. service conductors
2. neutral conductor
3. service
4. star
5. non-corrosive
6. $VD = 1 - x \frac{KL}{CM}$

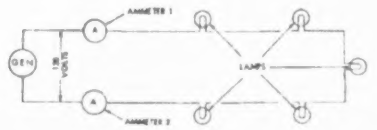
$$= \frac{30 \times 10.8 \times 100}{10{,}380}$$

$$= 3.12 \text{ volts}$$

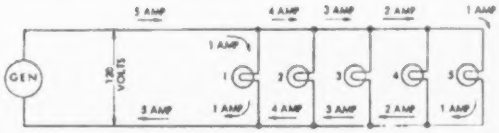
7. $12.00
8. 16%
9. 1,440 total hours
10. $22.50

IV-2-A-AS

1. all the lights will stop burning
2.


AMMETER 1
GEN
120 VOLTS
LAMPS
A
A
AMMETER 2

3.


5 AMP
4 AMP
3 AMP
2 AMP
1 AMP
1 AMP
GEN
120 VOLTS
1
2
3
4
5
5 AMP
1 AMP
4 AMP
3 AMP
2 AMP
1 AMP

4. brass - 42 aluminum - 17 copper - 10.8
5. the current would increase
6. 44 ohms
7. 3 amps
8. 48 square inches

IV-2-B-AS

1. white or neutral gray
2. No. 8
3. stranded
4. breakers
5. sections of a circuit can be operated with switches

IV-3-A-AS

1. on the floor plans
2. the electrical contractor
3. 12,000 watts
4. copper wire
5. #14 wire

IV-3-B-AS

1. electrician
2. as a dash
3. they are marked with colored markers
4. three-way
5. weatherproof

IV-4-A-AS

1. nine inches
2. metal
3. 50 - 80 watts
4. 120 volts
5. economical
6. 120 volts
7. 24 volts

IV-4-B-AS

1. 240 or 120
2. 10 amps
3. 15 amps
4. 120 volts
5. heating units
6. 22 amps

IV-4-C-AS

1. panel
2. on-off
3. 12
4. motor operated
5. sink

IV-4-D-AS

1. to prevent fires
2. 110° C
3. in line fuse
4. fuse
5. in series with the black line lead and black line to the ballast

ANSWERS TO ASSIGNMENT SHEETS

SECTION V - PAINTING AND DECORATING

V-1-A-AS

1. T
2. F
3. T
4. F
5. T
6. T
7. T
8. F
9. T
10. T

V-1-B-AS

1. F
2. F
3. T
4. T
5. T
6. T
7. F
8. F
9. T
10. T

V-1-C-AS

1. perimeter
2. 400′
3. ceiling
4. 8′
5. gallons
6. separate
7. 8 inches
8. 22 inches

V-2-A-AS

1. seal
2. primer
3. latex
4. oil base
5. paint
6. oil base
7. masonry
8. primer

V-2-B-AS

1. T
2. F
3. F
4. T
5. F
6. F
7. T
8. F
9. T
10. F

V-2-C-AS

1. no, it's been used for a long time
2. so that it will dry faster
3. it takes 4 to 8 hours
4. to give more detail and depth
5. the appearance of leather, fabric, or wood grain
6. is applied over a base coat of paint
7. to produce a satin effect
8. it will look like parchment
9. you would use the ragging procedure
10. you would use soft, lint free, old sheets that could be torn up

V-3-A-AS

1. texture
2. textured wall
3. to use on damaged walls
4. use one with designs to draw attention
5. burlap is good for natural appearance
6. yes
7. yes
8. yes

V-3-B-AS

1. hard to clean
2. seam roller
3. cork
4. design and pattern
5. one piece
6. separate
7. grasscloth
8. synthetic
9. design
10. disguise

V-3-C-AS

1. some jobs will need more than it would appear, and to allow for damage
2. keep some for repair and return extra to the dealer
3. one roll
4. it is the total of all four walls
5. chart for single standard rolls

ANSWERS TO ASSIGNMENT SHEETS

SECTION VI - PLUMBING

VI-1-A-AS

1. **Wood chisel**—used to cut notches in joists and studs
2. **Plastic pipe**—these cutters are used to cut plastic pipe
3. **Hole saw**—used with electric drills to cut holes in floors and walls to run pipes
4. **Plumber's folding rule**—is used for measuring short lengths of pipe, angles, locations
5. **Tubing cutters**—used for cutting copper tubing
6. **Variable speed sawzall**—used to cut through materials most saws will not cut
7. **Steel tape measure**—is used to determine location points, length of pipe, depth of ditches
8. **Locking pliers**—used to hold pipe or other fixtures
9. **Pipe dies**—used to thread outside diameters of pipe
10. **Try square**—used for marking and cutting

VI-1-B-AS

1. **Gate valve**—used to close and open pipes carrying water
2. **Nipples**—short pieces of pipe threaded on both ends
3. **Closet flange**—used to connect the watercloset to drain pipe
4. **Ball valve**—used to reduce the water pressure in buildings
5. **Union**—used to couple pipes together where they can be easily taken apart
6. **Meter stop valve**—used between the water meter and the residence
7. **Compression faucet**—mostly used in laundry rooms
8. **Repair clamp**—used to strap around pipes to stop leaks
9. **Bushing**—reduces the size of a pipe when a smaller one is needed
10. **Pressure relief valve**—used in water heaters to release pressure buildup

VI-1-C-AS

1. it is used to shred food and wash it down the drain
2. they are installed under the sink per manufacturer's instructions
3. flush valves
4. in parks, schools, and commercial buildings
5. disposals are electrically operated with an on-off switch
6. by pressing down on the handle to release the water
7. by pressing or turning a lever to release the water
8. they could jam the blades and burn out the motor
9. in restaurants, homes, cafeterias
10. plumbers usually install the disposals

V-2-A-AS

1. piping
2. - - -SW- - -
3. Ⓗ
4. 1/4" = 1'-0"
5. drain pipe
6. 1,160 lineal feet

V-2-B-AS

1. if the vent stack has stoppage
2. a tape or snake
3. by getting on the roof and running a plumbers tape through the vent pipe
4. it will help clear the drain and prevent stoppages
5. electronically driven snake, hand crank snake, flat type snake

V-2-C-AS

1. from deterioration usually where pipe was threaded
2. because the coating has been removed
3. by using a wraparound clamp
4. the galvanized pipes have a mineral build up, which closes the inside diameter
5. soil minerals do not affect the walls of plastic pipe
6. when the weather is hot
7. pipes can curve around objects and bend, especially when weather is hot
8. no, because you can usually bend the pipe enough to get around it
9. the fitting and part of the pipe must be replaced
10. use plastic pipe cleaner and then use PVC glue

V-3-A-AS

1. a relief valve
2. by running the vent pipe through the ceiling, attic, and through the roof to vent out fumes
3. use a soapy water solution
4. every six months for maintenance
5. it is usually cheaper to install and operate
6. on the cold water supply line
7. a three-inch galvanized pipe
8. because pressure could build up inside the tank and it could explode
9. check gas line for leaks with soapy solution, then light the burner
10. because it does not have to be vented
11. 1/8 inch

APPENDIX B

ANSWERS TO COMPETENCY TESTS

ANSWERS TO COMPETENCY TESTS

SECTION II - CARPENTRY

II-1-CT

1. working drawings
2. to show detail parts of a drawing
3. to show specific dimensions clearly
4. transverse
5. longitudinal
6. windows, cornice, doors
7. to clarify manner construction is done
8. piping is not on most residence plans
9. grid paper
10. for communication purposes

II-2-CT

1. ground level
2. where frost penetration is no problem
3. a monolithic slab
4. undisturbed earth
5. steel reinforcement rods and welded wire fabric
6. to prevent warpage or shrinkage
7. because of the smooth surface it provides
8. longest
9. chalkline
10. in the corner
11. 1,040 square feet
12. 82.5 board feet
13. 61 1/4 total width
14. 10,500 labor hours
15. 2,070 square feet

II-3-CT

1. horizontal
2. riser
3. stringers and carriages
4. handrail
5. balustrade
6. mortise

7. through sections and details
8. to be sure stairway will fit after construction has begun
9. code
10. the riser and run is same as carriage, but in reverse
11. 7 1/4 x 5/1 = 29/4 x 5/1 = 145/4 = 36 1/4 inches
12. 31 1/2 inches
13. 16 board feet
14. 2 board feet

II-4-CT

1. the actual wall frame
2. all the horizontal parts
3. residential construction
4. split level construction
5. the bearing partitions
6. the outside walls
7. nonbearing partitions
8. it is removed with a handsaw
9. for easy assembly
10. with power screwdrivers and self-tapping screws
11. 21 braces
12. 6 pieces
13. 49 joists
14. 16 board feet
15. 30 board feet

II-5-CT

1. T
2. F
3. F
4. T
5. T
6. F
7. T
8. F
9. T
10. T
11. 8 windows

II-6-CT

1. T
2. F
3. F
4. T
5. T
6. F
7. T
8. T
9. T
10. T
11. $609.00
12. 4 3/8 inches
13. 1 3/16 inches
14. 74 nails

II-7-CT

1. T
2. F
3. F
4. T
5. F
6. F
7. T
8. F
9. T
10. F
11. 3,000 shingles
12. $4,950.00
13. 68 sheets
14. $164.80
15. 0.75 hour

ANSWERS TO COMPETENCY TESTS

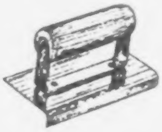
SECTION III - MASONRY

III-1-CT

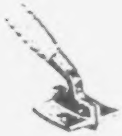
1. brick, stone, marble
2. tile setters, plasterers, terrazzo workers and concrete masons
3. one out of every three are self-employed
4. small jobs like patios, walks, fireplaces
5. age 17
6. someone who has completed their apprenticeship in the trade
7. T
8. F
9. T
10. T
11. \$1,000 x .05 = \$50.00
12. \$2,500 x .08 = \$200.00
13. \$500.00 x .08 = \$40.00
14. 1,080 bricks
15. 2,079.375 pounds

III-2-CT Descriptions evaluated to the satisfaction of the instructor.

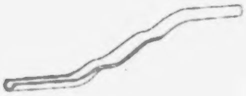
1. C



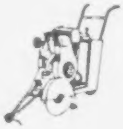
2. D



3. I

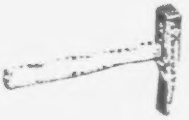


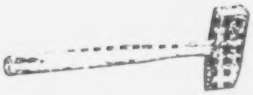
4. B



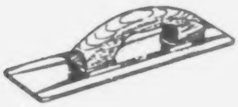
5. G

6. E



7. A 

8. F

9. H 

10. electrical or gasoline engines

11. smooth, dense finish

12. 14 %

13. $24.00

III-3-CT

1. to keep it from setting up
2. plastic, hardened
3. the durability of mortar
4. bondstones
5. reinforcing
6. mortar will be brittle
7. type N mortar
8. because of the stones' hardness and denseness
9. a stiff fiber brush and clean water
10. acids, wire brushes, sandblasting
11. $103.00 profit
12. 24,716 total weight
13. $70.00
14. 23 1/12 cubic yards of mortar

III-4-CT

1. capped with a solid course of masonry in order to serve as a termite barrier and to help distribute loads from floor beams
2. the T foundation wall
3. minimum of 24 hours
4. you should form a cove
5. at least 48 hours
6. to provide a two- to three-inch continuous air space
7. they are applied by spraying or brushing
8. the solvent type will penetrate the best
9. expansion cracks

10. vertical
11. 180 feet
12. 8,160 square feet
13. 1,175 lineal feet
14. 1,440 hours
15. 975 square feet

III-5-CT

1. at 1/4" = 1′ - 0" scale
2. size means inch to inch
3. scale means inches to feet
4. to 1′ - 0"
5. 1 7/8"
6. specs
7. construction documents
8. general conditions and technical sections
9. they include agreements, insurance, responsibility for permits, supervision, payment for work, and temporary utilities
10. the technical sections

ANSWERS TO COMPETENCY TESTS

SECTION IV - RESIDENTIAL ELECTRICIAN

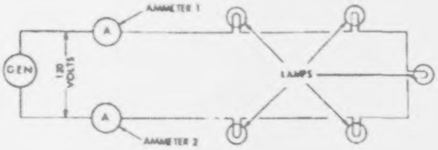
IV-1-CT

1. service conductors
2. neutral conductor
3. service
4. star
5. non-corrosive
6. 3.12 volts
7. 16%
8. $12.00

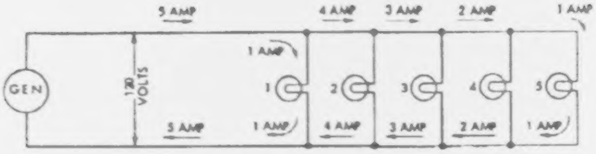
IV-2-CT

1. all the lights will stop burning

2.


AMMETER 1
A
GEN
120 VOLTS
LAMPS
A
AMMETER 2

3.


5 AMP
4 AMP
3 AMP
2 AMP
1 AMP
1 AMP
GEN
120 VOLTS
1
2
3
4
5
5 AMP
1 AMP
4 AMP
3 AMP
2 AMP
1 AMP

4. brass - 42, aluminum - 17, copper - 10.8
5. the current would increase
6. white or gray
7. No. 8 or larger
8. stranded
9. breakers
10. sections of a circuit can be operated with switches
11. A = 48 square inches
12. A = 199.5 square feet
13. A = 615.44 square feet
14. 44 ohms
15. 3 amps

IV-3-CT

1. on the floor plans
2. the electrical contractor
3. 12,000 watts
4. copper wire
5. #14 wire
6. electrician
7. as a dash
8. they are marked with colored markers
9. three-way
10. weatherproof

IV-4-CT

1. metal
2. 50-80 watts
3. 120 volts
4. 10 amps
5. 15 amps
6. heating units
7. 12
8. sink
9. in-line fuse
10. fuse
11. 120 volts
12. 24 volts
13. 22 amps

ANSWERS TO COMPETENCY TESTS

SECTION V - PAINTING AND DECORATING

V-1-CT

1. T
2. T
3. T
4. T
5. F
6. F
7. T
8. F
9. F
10. T
11. 8 inches
12. 22 inches

V-2-CT

1. T
2. F
3. F
4. T
5. F
6. T
7. T
8. F
9. T
10. F

V-3-CT

1. texture
2. textured wall
3. burlap is good for a natural appearance
4. yes
5. hard to clean
6. cork
7. grasscloth
8. synthetic
9. design
10. disguise

ANSWERS TO COMPETENCY TESTS

SECTION VI - PLUMBING

VI-1-CT

1. used to shred food and wash it down the drain
2. attached and installed under the sink per instructions
3. flush valves
4. parks, schools, and commercial buildings
5. disposals are electrically operated with an on-off switch
6. by pressing down on the handle to release the water when the diaphragm is moved
7. by pressing or turning a lever to release the water using an auxiliary valve, and it is installed by a plumber
8. they could jam the blades and burn out the motor
9. restaurants, homes, and cafeterias to dispose of leftover food
10. plumbers usually install disposals because they connect to the waste system

VI-2-CT

1. piping
2. H
3. 1/4" = 1' - 0"
4. a tape or snake
5. it will help to clear the drain and prevent stoppages
6. because the coating has been removed around the threads
7. by using a wrap-around clamp
8. soil minerals do not affect the walls of plastic pipe
9. when the weather is hot
10. the fitting plus part of the pipe must be replaced
11. 1,160 lineal feet

VI-3-CT

1. a relief valve
2. by running a vent pipe through the ceiling, attic, and roof in order to vent out fumes
3. apply a soapy water solution around joints and fittings, then turn on gas
4. every six months for maintenance
5. it does not have to be vented
6. on the cold water supply line
7. a three-inch galvanized pipe
8. pressure could build up inside the tank and it could explode
9. check gas line for leaks with soapy solution, then light the burner
10. because it does not have to be vented
11. 1/8 inch

COMPLIANCE STATEMENT

TITLE VI, CIVIL RIGHTS ACT OF 1964; THE MODIFIED COURT ORDER, CIVIL ACTION 5281, FEDERAL DISTRICT COURT, EASTERN DISTRICT OF TEXAS, TYLER DIVISION

Reviews of local education agencies pertaining to compliance with Title VI Civil Rights Act of 1964 and with specific requirements of the Modified Court Order, Civil Action No. 5281, Federal District Court, Eastern District of Texas, Tyler Division are conducted periodically by staff representatives of the Texas Education Agency. These reviews cover at least the following policies and practices:

(1) acceptance policies on student transfers from other school districts;

(2) operation of school bus routes or runs on a non-segregated basis;

(3) nondiscrimination in extracurricular activities and the use of school facilities;

(4) nondiscriminatory practices in the hiring, assigning, promoting, paying, demoting, reassigning, or dismissing of faculty and staff members who work with children;

(5) enrollment and assignment of students without discrimination on the basis of race, color, or national origin;

(6) nondiscriminatory practices relating to the use of a student's first language; and

(7) evidence of published procedures for hearing complaints and grievances.

In addition to conducting reviews, the Texas Education Agency staff representatives check complaints of discrimination made by a citizen or citizens residing in a school district where it is alleged discriminatory practices have occurred or are occurring.

Where a violation of Title VI of the Civil Rights act is found, the findings are reported to the Officer for Civil Rights, Department of Health, Education, and Welfare.

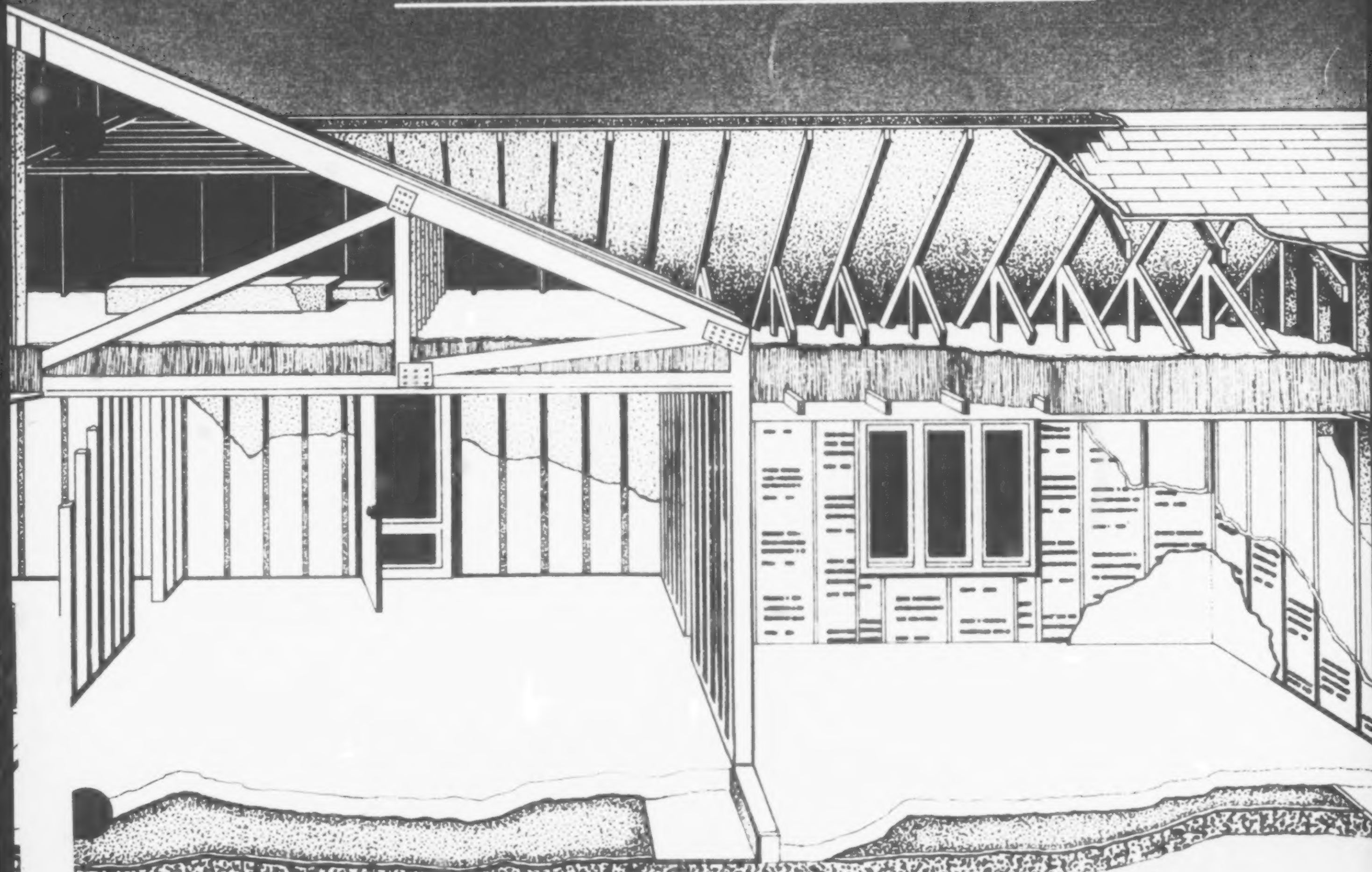
If there is a direct violation of the Court Order in Civil Action No. 5281 that cannot be cleared through negotiations, the sanctions required by the Court Order are applied.

TITLE VII, CIVIL RIGHTS ACT OF 1964; EXECUTIVE ORDERS 11246 AND 11375; TITLE IX, 1973 EDUCATION AMENDMENTS; REHABILITATION ACT OF 1973 AS AMENDED; 1974 AMENDMENTS TO THE WAGE-HOUR LAW EXPANDING THE AGE DISCRIMINATION IN EMPLOYMENT ACT OF 1967; AND VIETNAM ERA VETERANS READJUSTMENT ASSISTANCE ACT OF 1972 AS AMENDED IN 1974.

It is the policy of the Texas Education Agency to comply fully with the nondiscrimination provisions of all federal and state laws and regulations by assuring that no person shall be excluded from consideration for recruitment, selection, appointment, training, promotion, retention, or any other personnel action, or be denied any benefits or participation in any programs or activities which it operates on the grounds of race, religion, color, national origin, sex, handicap, age, or veteran status (except where age, sex, or handicap constitute a bona fide occupational qualification necessary to proper and efficient administration). The Texas Education Agency makes positive efforts to employ and advance in employment all protected groups.

Building Trades II

STUDENT MANUAL



Educational Development and Training Center
East Texas State University • Commerce, TX 75428

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BUILDING TRADES II
STUDENT MANUAL

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Curriculum Specialist

Published by
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1990

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Larry Hamlin
Curriculum Specialist
Trade and Industrial Education

PREFACE

The Educational Development and Training Center at East Texas State University is striving to provide needed materials to vocational instructors within the state.

The purpose of this publication is to assist instructors in improving instruction. As these materials are used, it is hoped that student performance will improve and students will be better prepared to assume a role in the field of building trades. This publication extends the *Building Trades I Student Manual.*

Instructional materials in this publication are written in terms of student performance, using measurable objectives. This approach augments the teaching-learning process. Criterion-referenced evaluation instructions are provided for uniform measurement of student progress. In addition to evaluating recall information, teachers are encouraged to evaluate the other areas, including progress and the finished product.

The instructor should, where appropriate, reinforce the application of basic academic skills. For example, when addressing the estimating construction costs area of study, the instructor should stress to students that they will be applying specific mathematical skills such as addition, subtraction, multiplication, and division that they have learned in previous academic courses. Effective teaching practices research, and consequently the Texas Teacher's Appraisal System emphasizes the relationship of new learning to prior or future learning. In some cases, specific academic skills needed to complete job tasks may not have yet been addressed in the academic courses in which the students have been enrolled. If this is the case, the vocational instructor should introduce and explain the academic skills, and students should achieve a level of mastery that will allow them to perform the job tasks. Instructors of vocational courses are encouraged to work closely with instructors of academic courses to ensure that students are taught fundamental academic principles correctly.

Every effort has been made to make this publication basic, readable, and by all means, usable. Three vital areas of instruction (motivation, personalization, and localization) are not included in this publication; however, they should be capitalized on by the instructor. Only then will this publication really become a vital part of the teaching-learning process.

COMMON ESSENTIAL ELEMENTS

75.88 Trade and Industrial Education

(a) The elements in this subsection are common to all trade and industrial courses unless otherwise indicated and shall be included in each course at the appropriate level. They are described here to preclude repetitions in each course. Every school offering trade and industrial education shall provide courses which include the following essential elements:

(1) Leadership concepts and skills. The student shall be provided opportunities to:

(A) demonstrate skills, characteristics, and responsibilities of leaders and effective group members;

(B) demonstrate a knowledge of parliamentary procedure principles;

(C) plan and conduct leadership activities; and

(D) prepare for effective citizenship and for participation in our democratic society.

(2) Concepts and skills related to successful employment and/or postsecondary training. The student shall be provided opportunities to:

(A) identify employment opportunities and preparation requirements in chosen fields;

(B) identify effective methods to secure and terminate employment;

(C) demonstrate effective communication skills both oral and written and follow through on assigned tasks;

(D) demonstrate dependability and punctuality;

(E) demonstrate productive work habits and attitudes;

(F) understand the importance of taking pride in the quality of work performed;

(G) recognize the dignity in work;

(H) develop skills in planning and organizing work;

(I) apply required methods and sequences when performing tasks;

(J) apply principles of time management and work simplification when performing assigned tasks;

(K) identify ethical practices and responsibilities; and

(L) understand the importance of the application of organizational policies and procedures.

(3) Concepts and skills associated with entrepreneurship. The student shall be provided opportunities to:

(A) identify opportunities for business ownership;

(B) understand the risk and profit motive factor;

(C) understand the elements and advantages of the free enterprise system; and

(D) explain the role of small business in the free enterprise system.

(4) Concepts and skills related to safety and safe working conditions. The student shall be provided opportunities to identify and apply safe working practices to all training situations.

(5) Concepts and skills associated with human relations and personality development. The student shall be provided opportunities to:

(A) understand the importance of maintaining good health and proper appearance for effective job performance;

(B) understand oneself and others;

(C) exercise self-control;

(D) accept and use criticism;

(E) recognize basic human relationships as they relate to business success; and

(F) demonstrate characteristics for successful working relationships.

(6) Concepts and skills related to personal and business management. The student shall be provided opportunities to:

(A) explain how management assists in reaching personal and family goals;

(B) explain the management process;

(C) describe the role of management in controlling stress;

(D) identify and understand personal checking accounts;

(E) identify and understand personal loan application processes;

(F) identify and understand different financial institutions;

(G) identify the role and function of business management:

(H) understand the lines of authority; and

(I) identify effective supervisory techniques.

(7) Concepts and skills associated with the specific occupation being taught. The student shall be provided opportunities to:

(A) understand the basic concepts of and develop proficiency in the occupational area for which instruction/training is provided;

(B) develop a fundamental understanding of mathematical principles and scientific procedures;

(C) understand terminology utilized;

(D) identify tools, equipment, and materials used; and

(E) develop and demonstrate appropriate techniques for the selection, use, maintenance, and storage of tools, equipment, and materials.

ESSENTIAL ELEMENTS FOR BUILDING TRADES II

(e) Building trades (two-three units) shall include the essential trade and industrial education elements and the following essential elements:

(1) Concepts and skills associated with residential carpentry. The student shall be provided opportunities to:

(A) read blueprints and work drawings;

(B) identify and estimate costs of various building materials;

(C) demonstrate appropriate concrete form setting techniques;

(D) understand concrete placement and finishing procedures;

(E) utilize appropriate framing techniques including walls, floors, ceilings, rafters, and trusses;

(F) install roof flashing and covering;

(G) understand and demonstrate proper techniques in door and window installation;

(H) identify and install various exterior and interior wallcovering and trim; and

(I) understand proper techniques in stair framing.

(2) Concepts and skills associated with bricklaying. The student shall be provided opportunities to understand construction processes utilized in the construction of stonewalls, foundation walls, repairing cracks, and blueprint reading.

(3) Concepts and skills associated with residential electrician. The student shall be provided opportunities to:

(A) understand schematic diagrams and symbols; and

(B) understand the installation of electric service, wiring, and fixtures.

(4) Concepts and skills associated with painting and decorating. The student shall be provided opportunities to understand the basic principle of drywall, interior, and exterior finishes.

(5) Concepts and skills associated with plumbing. The student shall be provided opportunities to understand the process and sequence of installing external and internal plumbing in residential construction.

REFERENCE: *Building Trades I*, Unit I

STUDENT INFORMATION SHEET
CARPENTRY

UNIT: Blueprints and Working Drawings

TOPIC: Sectional Views

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(e)(1)(A)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly .

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will read and interpret the sectional and detail parts of blueprints correctly.

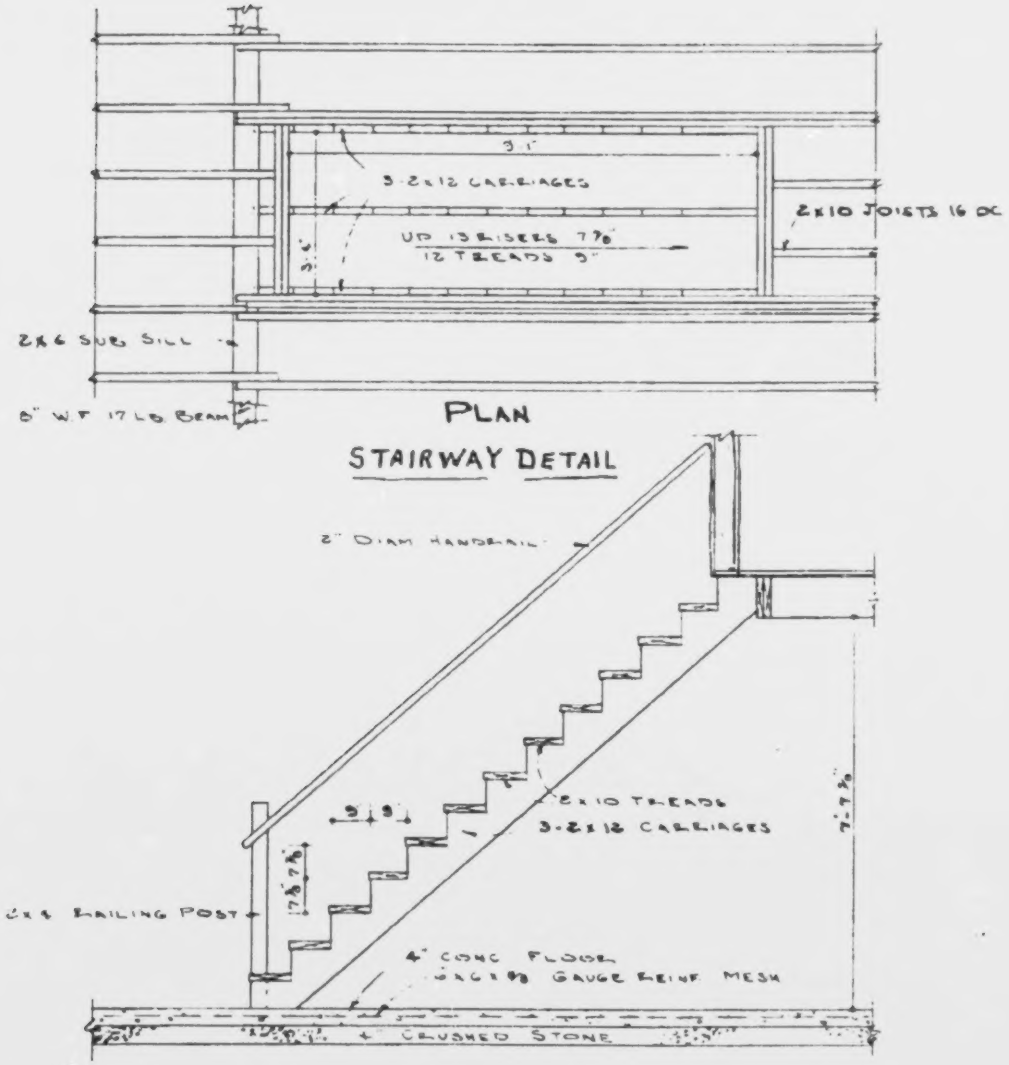
BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used when reading blueprints and working drawings will include mathematics, oral communications, and written communications.*

SECTIONAL VIEW

The sections are drawings for the construction of stairs, walls, bracing, or other details that are not clearly shown on framing, elevation, or floor plans. Sections reflect specific measurements that need to be seen to do the work correctly.

These views are drawn at a larger scale to show detail parts of a drawing. Sectional views that are taken through the narrow width of the entire building are "transverse" sections. The views taken through the long dimensions are "longitudinal" sections. (See TM-1.)

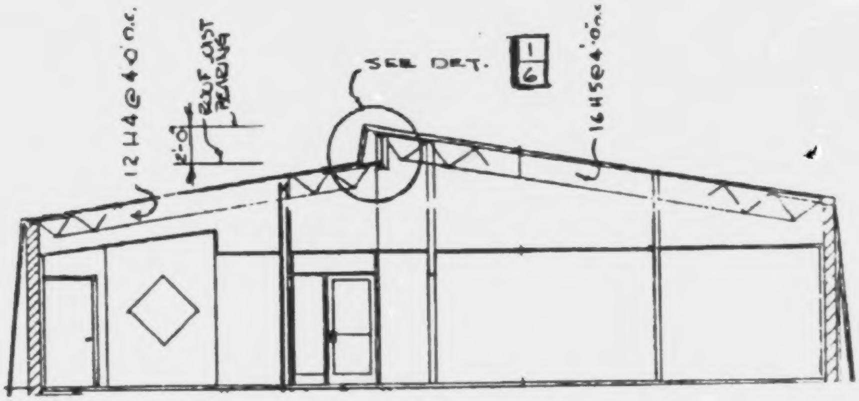
Details are also views where unusual or special work is to be done. These are views of special features such as windows, cornices, doors, arches, and retaining walls. They are drawn to a larger scale to clarify the manner in which construction will be performed. (See TM-2.)

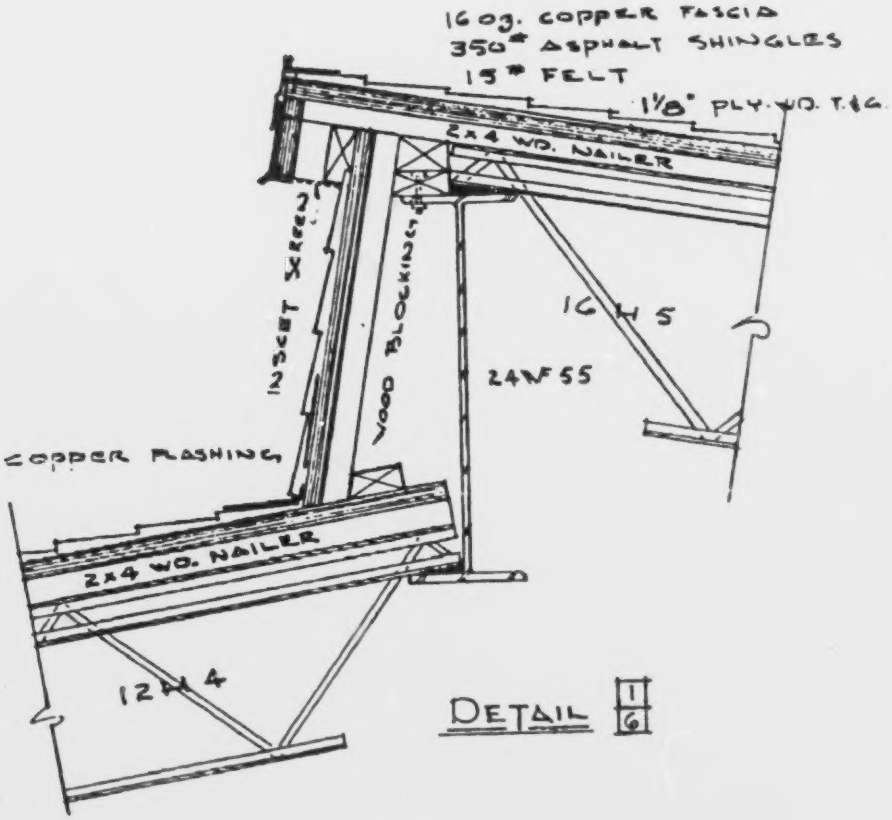


PLAN

STAIRWAY DETAIL

3'-1"
3-2x12 CARRIAGES
2x10 JOISTS 16 OC
UP 13 RISERS 7⅞"
12 TREADS 9"
3'-6"
2x6 SUB SILL
8" W.F. 17 LB. BEAM
2" DIAM HANDRAIL
2x10 TREADS
3-2x12 CARRIAGES
9 9
7⅞ 7⅞
7'-7⅞"
2x4 RAILING POST
4" CONC FLOOR
6x6 x 8/8 GAUGE REINF MESH
4" CRUSHED STONE


12 H4 @ 4'0" o.c.
ROOF JOIST BEARING
2'-0"
SEE DET.
1
6
16H5 @ 4'0" o.c.


16 oz. COPPER FASCIA
350# ASPHALT SHINGLES
15# FELT
1 1/8" PLY-WD. T.&G.
2x4 WD. NAILER
INSECT SCREEN
WOOD BLOCKING
16 H 5
24WF 55
COPPER FLASHING
2x4 WD. NAILER
12 H 4

DETAIL 1/6

TM-2

ASSIGNMENT SHEET
CARPENTRY

NAME______________________________ **DATE**________________________

UNIT: Blueprints and Working Drawings

TOPIC: Sectional Views

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(e)(1)(A)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will read and interpret the sectional and detail parts of blueprints correctly.

REFERENCES:
II-1-A-IS
B.T. I-Unit III

DIRECTIONS: Read and answer the following questions in the space provided.

1. What other term is used for a set of blueprints?

2. List three details that are shown on blueprints.

3. Why are details and sectional views used?

4. Why are views shown at a larger scale?

5. What views are shown through the narrow width of the building?

6. What views are shown through the long dimensions?

7. Details usually show what type of work?

8. Name three special features shown in details.

9. Views such as retaining walls are shown for what reason?

10. Using TM-2, draw a sketch of how detail 1/6 would be shown.

JOB SHEET

CARPENTRY

NAME______________________________ **DATE**________________________

UNIT: Blueprints and Working Drawings

NAME OF JOB: Sectional Views

ESSENTIAL ELEMENT(S): (a)(7)(A)
(a)(7)(C)
(e)(1)(A)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will read and interpret the sectional and detail parts of blueprints correctly.

TOOLS AND EQUIPMENT: Pencil, fractional rule

MATERIALS: 8 1/2" x 11" paper, TM-2

GENERAL INSTRUCTIONS: Using TM-2, draw the detail 1/6 as shown 1/8" larger.

PROCEDURES AND/OR TASKS:

1. Collect materials needed to do this task.

2. Mark in center of 8 1/2" x 11" paper the I-beam as shown 2 5/16" in length.

3. Continue to measure each line and detail as shown. When completed, give to instructor for evaluation.

II-1-A-JS-2

JOB SHEET

CARPENTRY

NAME________________________________ DATE____________________

UNIT: Blueprints and Working Drawings

NAME OF JOB: Sectional Views

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(e)(1)(A)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will read and interpret the sectional and detail parts of blueprints correctly.

TOOLS AND EQUIPMENT: Pencil, fractional rule

MATERIALS: 8 1/2" x 11" paper, detail blueprint in back of student manual

GENERAL INSTRUCTIONS: Using detail sections of the blueprint, draw detail for fireplace section to 1/4" = 1' 0".

PROCEDURES AND/OR TASKS:

1. Collect material needed to do this task.
2. Draw detail in middle of sheet.
3. Continue to measure and mark each line and detail as shown.
4. Be sure all labels and dimensions are accurate.
5. When completed, give to instructor for evaluation.

JOB SHEET

CARPENTRY

NAME______________________________ **DATE**________________________

UNIT: Blueprints and Working Drawings

NAME OF JOB: Estimating Board Feet

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(e)(1)(A)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will estimate board feet for a task correctly.

TOOLS AND EQUIPMENT: Calculator, 12" scale, pencil

MATERIALS: Attached sketch with job sheet, paper

GENERAL INSTRUCTIONS: This can be used as a simulated work task in any building trades program. Student(s) can apply skills aquired in completing specified job task at a job site. Use proper safety precautions. Estimate materials and cost of building a table.

PROCEDURES AND/OR TASKS:

1. Assemble tools, equipment, and materials.

2. Use this formula to find the number of board feet of lumber needed.

$$\text{bd ft.} = \frac{T'' \times W'' \times L'}{12}$$

where T'' = thickness in inches
W'' = width in inches
L' = length in feet

3. Determine sizes of lumber required.

4. Sizes are measured before lumber is finished.

5. These measurements will be used to find the board feet needed.

6. Find the number of board feet of 1" x 6" material needed.

7. Find the number of board feet of 3" x 3" material needed.

8. Find the number of board feet of 2" x 4" material needed.

9. Find the number of total board feet needed.

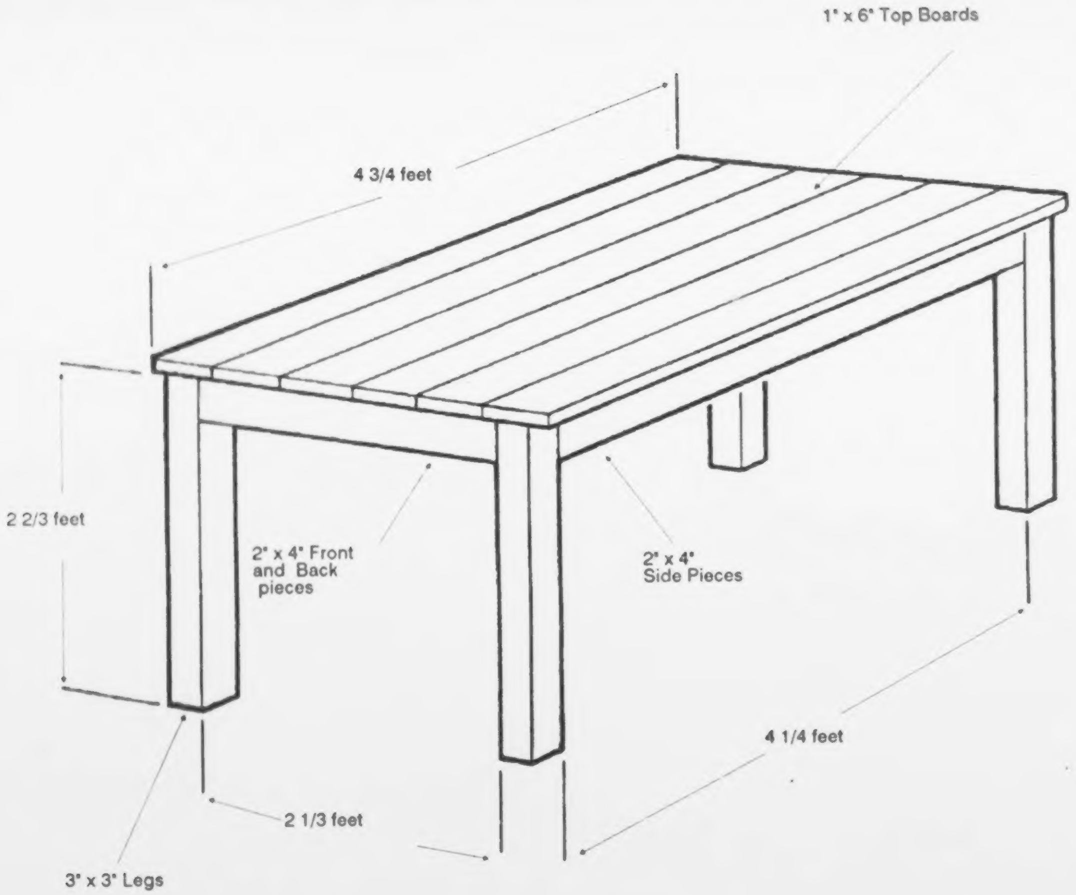
10. Estimate total cost of material.

11. Contact local lumber yard for prices of material.

12. Have instructor check work.

13. Replace tools, equipment, and materials.

14. Clean work surface.


1" x 6" Top Boards
4 3/4 feet
2 2/3 feet
2" x 4" Front and Back pieces
2" x 4" Side Pieces
4 1/4 feet
2 1/3 feet
3" x 3" Legs

STUDENT INFORMATION SHEET

CARPENTRY

UNIT: Blueprints and Working Drawings

TOPIC: Freehand Sketching

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(e)(1)(A)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will read, interpret, and develop freehand sketching correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used when reading blueprints and working drawings will include mathematics, oral communications, and written communications.*

SKETCHING

Sketching will probably be used by plumbers, architects, and engineers. The water distribution and sewage systems need to be more detailed. The piping diagrams are often not prepared for residences. The location of fixtures, symbols, floor drains, and exterior faucets are shown. The plumber will usually make a sketch on paper or grid paper of the location where fixtures will be installed and will then make a sketch for the piping. Using the blueprints and notes, the size and location of pipes can be sketched.

When sketching horizontal lines, mark end points with a dot. Sketch short, light lines between the points, keeping your eye on where the line is to stop, and then darken the line with one stroke down the line from one point to the other. Vertical lines are sketched using the same procedure. To sketch the arc, a triangle is most commonly used.

1. Project two lines until they meet (A).

2. Lay out desired radius arc from point of intersecting lines (B).

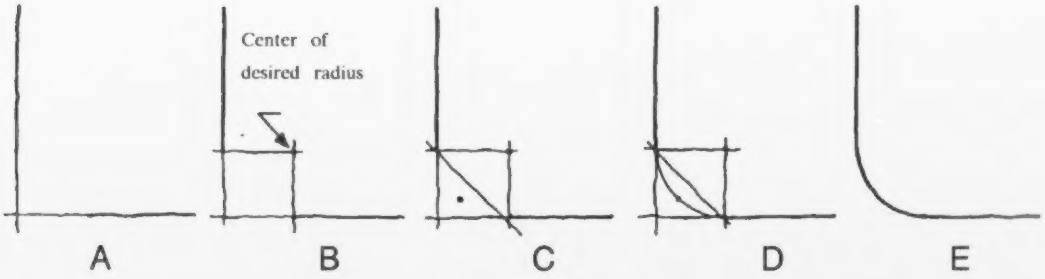
3. Connect these points to form a triangle (C).

4. Lightly stroke from where the arc is to start on vertical line through the center point to the horizontal line (D).

5. Darken the line for a continuous arc, then erase construction lines (E).

Sketching is frequently used by craftsworkers, architects, and engineers to construct ideas and communicate details to others.

When sketching thin lines, use a sharp point on the pencil and a rounded point for thicker lines.



ASSIGNMENT SHEET

CARPENTRY

NAME________________________________ **DATE**__________________________

UNIT: Blueprints and Working Drawings

TOPIC: Freehand Sketching

ESSENTIAL ELEMENT(S): (a)(7)(A)
(a)(7)(C)
(e)(1)(A)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will read, interpret, and develop freehand sketching correctly.

REFERENCES: II-B-1-IS

DIRECTIONS: Read and answer the following questions in the space provided.

1. Sketching would be used most by whom?

2. Why would plumbers need to make a sketch?

3. What type of paper is used for sketching?

4. What would you look for on blueprints in order to sketch piping to be installed?

5. Why are sketches made by different craftsworkers?

JOB SHEET
CARPENTRY

NAME________________________________ DATE____________________________

UNIT: Blueprints and Working Drawings

NAME OF JOB: Freehand Sketching

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(e)(1)(A)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will read, interpret, and develop freehand sketching correctly.

TOOLS AND EQUIPMENT: Sharp pencil

MATERIALS: Instructor to furnish sheets provided with job sheet. Floor plan is located in back of student manual.

GENERAL INSTRUCTIONS: By hand sketching piping, electrical, or other items on blueprints, students will better understand blueprints and ways to communicate with different trades involved with construction.

PROCEDURES AND/OR TASKS:

1. Using sheets provided, follow instructions and complete the exercise by hand.

2. When complete, give to instructor.

JOB SHEET

CARPENTRY

NAME______________________________ **DATE**________________________

UNIT: Blueprints and Working Drawings

NAME OF JOB: Draw Wall Section

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(e)(1)(A)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will read, interpret, and develop freehand sketching correctly.

TOOLS AND EQUIPMENT: Sharp pencil, fractional rule

MATERIALS: 8 1/2" x 11" grid paper (larger, if possible), sketch from back of student manual for brick cavity wall.

GENERAL INSTRUCTIONS: Draw cavity wall section on grid paper, the 1/4" square being 1 foot. Draw to 1/4" = 1' 0" scale. This will help students to better understand blueprints.

PROCEDURES AND/OR TASKS:

1. Collect materials needed to do this task.
2. Using section detail provided, measure with rule and draw to scale.
3. Complete sketch and label as per original.
4. When complete, give to instructor.

II-1-B-JS-3

JOB SHEET

CARPENTRY

NAME______________________________ **DATE**________________________

UNIT: Blueprints and Working Drawings

NAME OF JOB: Measurements of Floor Plan

ESSENTIAL ELEMENT(S): (a)(7)(A)
(a)(7)(C)
(e)(1)(A)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to measure a floor plan correctly.

TOOLS AND EQUIPMENT: Architect's scale or 12" scale, calculator, pencil

MATERIALS: Attached sketch with job sheet, paper

GENERAL INSTRUCTIONS: This can be used as a simulated work task in any building trades program. Student(s) can apply skills aquired in completing specified job task at a job site. Use proper safety precautions.

PROCEDURES AND/OR TASKS:

1. Assemble tools, equipment, and materials.
2. Use floor plan provided; record answers.
3. Measure and calculate the distance in feet and inches for dimension:

    A. ____________________.

4. Measure and calculate the distance in feet and inches for dimension:

B. ______________.

5. Measure and calculate the distance in feet and inches for dimension:

C. ______________.

6. Measure and calculate the distance in feet and inches for dimension:

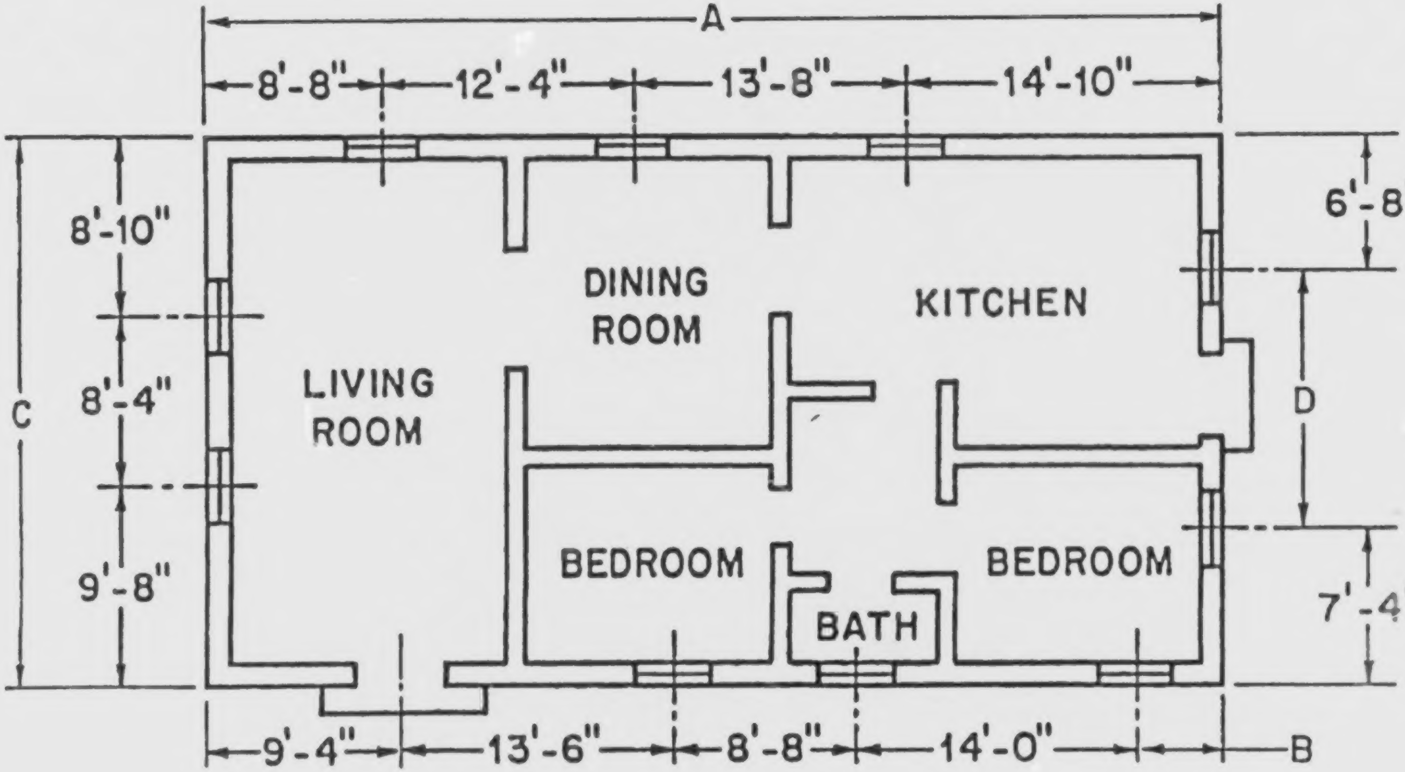
D. ______________.

7. Have instructor check work.

8. Replace tools, equipment, and material.

9. Clean work area.

II-1-B-JS-3


A
8'-8"
12'-4"
13'-8"
14'-10"
6'-8"
8'-10"
8'-4"
9'-8"
C
DINING ROOM
KITCHEN
LIVING ROOM
D
BEDROOM
BATH
BEDROOM
7'-4"
9'-4"
13'-6"
8'-8"
14'-0"
B

STUDENT INFORMATION SHEET

CARPENTRY

UNIT: Floor Systems

TOPIC: Slab Floors

ESSENTIAL ELEMENT(S): (a)(7)(A)
(a)(7)(C)
(e)(1)(E)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to lay reinforcement for slab floors and construct subfloors correctly.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will lay reinforcement for slab floors correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used when constructing floor systems will include mathematics and reading concepts and skills.*

SLAB FLOORS

The slab floor is a floor system poured at ground level.

Concrete slabs are used as main floors in some areas where frost penetration is no problem. The foundations with a monolithic slab are called "floating slab" construction. Another method for pouring a slab floor is to pour the foundation wall to floor height; then pour the floor within the walls separated by expansion joints.

When reinforcing slab floors, it is expected to have tension due to soil shifting or settling. The use of steel reinforcing rods or welded wire fabric is used in the concrete. This type of reinforcement would be noted on the blueprints.

Parts of the slab could be much deeper, especially if a fireplace were to be constructed.

The footings for the concrete slab should rest on undisturbed earth and have steel reinforcement rods placed in the footings. The footings are carefully placed because of the load they have to support.

Footings and foundation walls need to be extended down, below the frost line, and on solid soil. The subgrade under the slab should be free from roots, debris, and sod.

When preparing the subgrade and fill, various types of installations should be completed. The water supply lines, placed under the slab, should be installed in trenches deep enough to keep them from freezing. The drainage and waste lines for bathrooms should also be installed at this time. After these installations have been completed and fill has been compacted and brought to grade, a vapor barrier should be placed over the sub-base.

Vapor barriers are rolled roofing, 4-mil polyethylene film. This material should be laid in sections and overlapped at least six inches to form a good seal. When vapor barriers and the mechanical work is complete, reinforcing mesh is laid. Usually a 6′ x 6′ x 10′-gauge mesh will be sufficient for residential work. When the slab is poured, this material should be 1 1/2" below the surface of the concrete.

II-2-A-AS

ASSIGNMENT SHEET

CARPENTRY

NAME______________________________ **DATE**________________________

UNIT: Floor Systems

TOPIC: Slab Floors

ESSENTIAL ELEMENT(S): (a)(7)(A)
(a)(7)(C)
(e)(1)(E)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to lay reinforcement for slab floors and construct subfloors correctly.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will lay reinforcement for slab floors correctly.

REFERENCES: II-2-A-IS
B.T. I-Unit III

DIRECTIONS: Read and answer the following questions in the space provided.

1. At what level is a slab floor poured?

2. Concrete floors are used in what areas?

3. What is a floating slab construction called?

4. Why is reinforcement installed when pouring slabs?

5. Where would the slab be reinforced and poured deeper?

6. Where should the footings rest?

7. Why are the footings carefully placed?

8. What types of reinforcement are used in slab floors?

9. A carpenter estimates a job requiring 550 board feet of lumber. He allows an additional 15% for waste. How many board feet are allowed for waste?

10. A contractor budgets $147,000.00 for labor. How many hours of labor can be hired if the labor cost is $14.00 per hour?

JOB SHEET

CARPENTRY

NAME______________________ **DATE**______________________

UNIT: Floor Systems

NAME OF JOB: Estimating Footings

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(1)(G)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to lay reinforcement for a slab floor and construct a subfloor correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to estimate concrete correctly.

TOOLS AND EQUIPMENT: Calculator, pencil

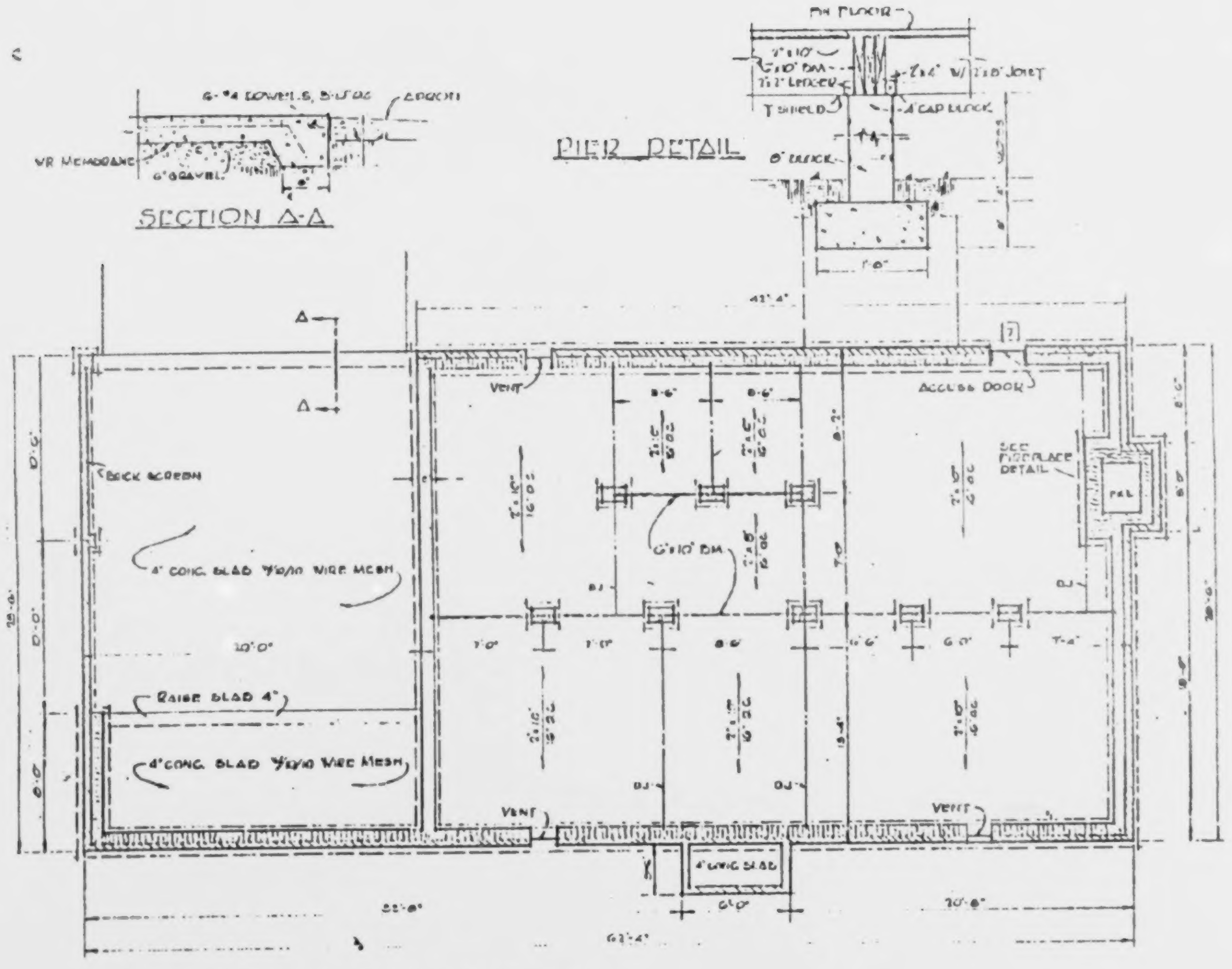
MATERIALS: Paper

GENERAL INSTRUCTIONS: Estimates have to be made before construction can begin. Use the formula for cubic yards — width x length x thickness ÷ 27—located on the formula sheet, page 225 in the appendix. Check with concrete contractor for price of mix and list cost for the job. Estimates are made in order for contractor to know if he/she can make a profit and charge fairly for his/her work.

PROCEDURES AND/OR TASKS:

1. Using paper, pencil, and calculator, figure the amount of concrete needed to pour footing for house using dimensions on foundation plan provided with the job sheet.
2. List cost for concrete.

3. Give to instructor to evaluate.


SECTION A-A
6-#4 DOWELS, 5'-0" OC
APRON
VR MEMBRANE
6" GRAVEL
PIER DETAIL
FIN FLOOR
2" x 10"
2" x 10" BM
2" x 2" LEDGER
2" x 4" W/ 2" x 8" JOIST
T SHIELD
4" CAP BLOCK
8" BLOCK
1'-0"
42'-4"
A
A
VENT
ACCESS DOOR
SEE FIREPLACE DETAIL
BRICK SCREEN
4" CONC. SLAB 6/6/10/10 WIRE MESH
20'-0"
RAISE SLAB 4"
4" CONC. SLAB 6/6/10/10 WIRE MESH
6"x10" BM
DJ
VENT
VENT
4" CONC. SLAB
22'-8"
6'-0"
20'-8"
63'-4"
8'-6"
8'-6"
7'-0"
6'-0"
7'-4"
28'-0"

FOUNDATION PLAN

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STUDENT INFORMATION SHEET

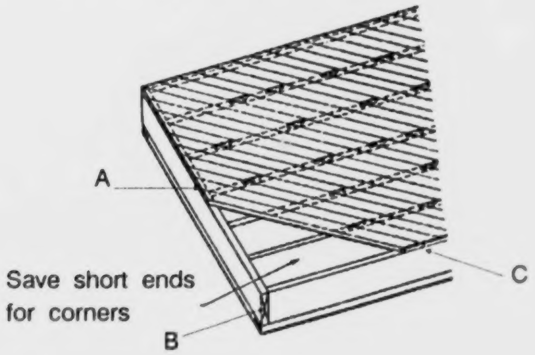
CARPENTRY

UNIT:	Floor Systems
TOPIC:	Subfloor Systems
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (e)(1)(E)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to lay reinforcement for slab floors and construct subfloors correctly.
SPECIFIC OBJECTIVE(S):	After completing this information sheet, the student(s) will construct a tongue-and-groove subfloor correctly.
BASIC ACADEMIC SKILLS APPLICATION:	*Basic academic skills used when constructing floor systems will include mathematics and reading concepts and skills.*

DIAGONAL SUBFLOOR

The preferred material for subfloors is tongue and groove, 3/4 inch thick, no more than 6 inches wide, and a soft type wood.

When the diagonal subfloor is laid, a relatively long board should be used first. The short cuts that are left may be used in corners, as the lengths decrease. The work can begin on both sides of the first diagonal length.



To lay out the first piece, begin at the corner "B" of the floor, and measure equal distances along the header joist and the first joist, "A" and "C". Snap a chalk line across the top of the joist between these two points to form a 45° angle. Cut the first board to fit along this line and nail it at each joist with two 8d nails, no more than 3/4 inch from the edge. Often, two or more boards will be needed to cross floor forming a joint. Do not allow two of these to be side by side on the same joist; there should be at least two boards between joints. The shorter boards that are left will be used in the corners.

GLUED FLOOR SYSTEM

For the glued floor system, panels are glued and nailed to the joist. This will ensure a squeak-free floor, reduced labor cost, and eliminates nail popping.

Before panels are put in place, a 1/4-inch bead of glue is applied to the top of each joist—put down only enough glue to install two panels at a time. Where panels meet on a joist, two beads of glue should be used.

When tongue-and-groove panels are used, apply a bead of glue in the groove of the panel and remove any excess to ensure a smooth floor.

II-2-B-AS

ASSIGNMENT SHEET

CARPENTRY

NAME______________________________ **DATE**________________________

UNIT: Floor Systems

TOPIC: Subfloor Systems

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(e)(1)(E)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to lay reinforcement for slab floors and construct subfloors correctly.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will construct a tongue-and-groove subfloor correctly.

REFERENCES:
II-2-B-IS
B.T. I-Unit III

DIRECTIONS: Choose the correct word(s) to complete each statement.

1. The ___________ board should be laid first on a diagonal floor.

   A. shortest
   B. widest
   C. longest
   D. none of the above

2. Work can be done on ___________ of the first diagonal length.

   A. left sides
   B. both sides
   C. right side
   D. left side only

3. A ___________ is used to mark across the top of the joist.

   A. tape measure
   B. board and pencil
   C. chalkline
   D. none of the above

4. When a line is across the joist, it forms a ___________ angle.

A. 30°
B. 40°
C. 80°
D. 45°

5. The board should be nailed no more than ___________ from the edge.

A. 1/2 inch
B. 3/8 inch
C. 1/4 inch
D. 3/4 inch

6. The board should be nailed with ___________ size nails.

A. 6d
B. 9d
C. 4d
D. 8d

7. The shorter board should be used ___________ of the floor.

A. in the middle
B. on the left side
C. in the corner
D. on the side

8. You should not allow two boards to be ___________ on the same joist.

A. end to end
B. side by side
C. together
D. none of the above

9. Material for subfloors is preferred to be 3/4 inch ___________ soft wood.

A. plywood
B. particle board
C. lath
D. tongue-and-groove

10. Material should not be more than ___________ in width.

A. 6 inches
B. 5 inches
C. 3 inches
D. 4 inches

11. A carpenter needs 2,020 square feet of plywood in order to put down a subfloor, and there is 980 square feet of plywood on hand. How much more square footage of plywood must the carpenter order? _______________

12. Four carpenters working together laid 8,280 square feet of flooring in one day. What was the average number of square feet laid by each carpenter that day? _______________

JOB SHEET

CARPENTRY

NAME________________________________ **DATE**__________________________

UNIT: Floor Systems

NAME OF JOB: Estimating Subfloor Material

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(1)(G)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to lay reinforcement for a slab floor and construct a subfloor correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to estimate materials used for subfloor correctly.

TOOLS AND EQUIPMENT: Calculator, pencil, 12" scale

MATERIALS: Paper, blueprints

GENERAL INSTRUCTIONS: Estimates have to be made before construction in order to know how much material to purchase, and what to charge the customer for work being done.

PROCEDURES AND/OR TASKS:

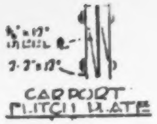
1. Using paper, pencil, and calculator, figure the amount of material needed to floor the living room using blueprint provided for floor plan.
2. Check with lumber yard for prices on material used for flooring using tongue-and-groove, 3/4" thick, no more than 6" wide boards.
3. List price of material.

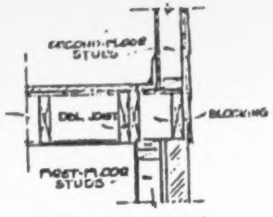
4. Give to instructor to evaluate.

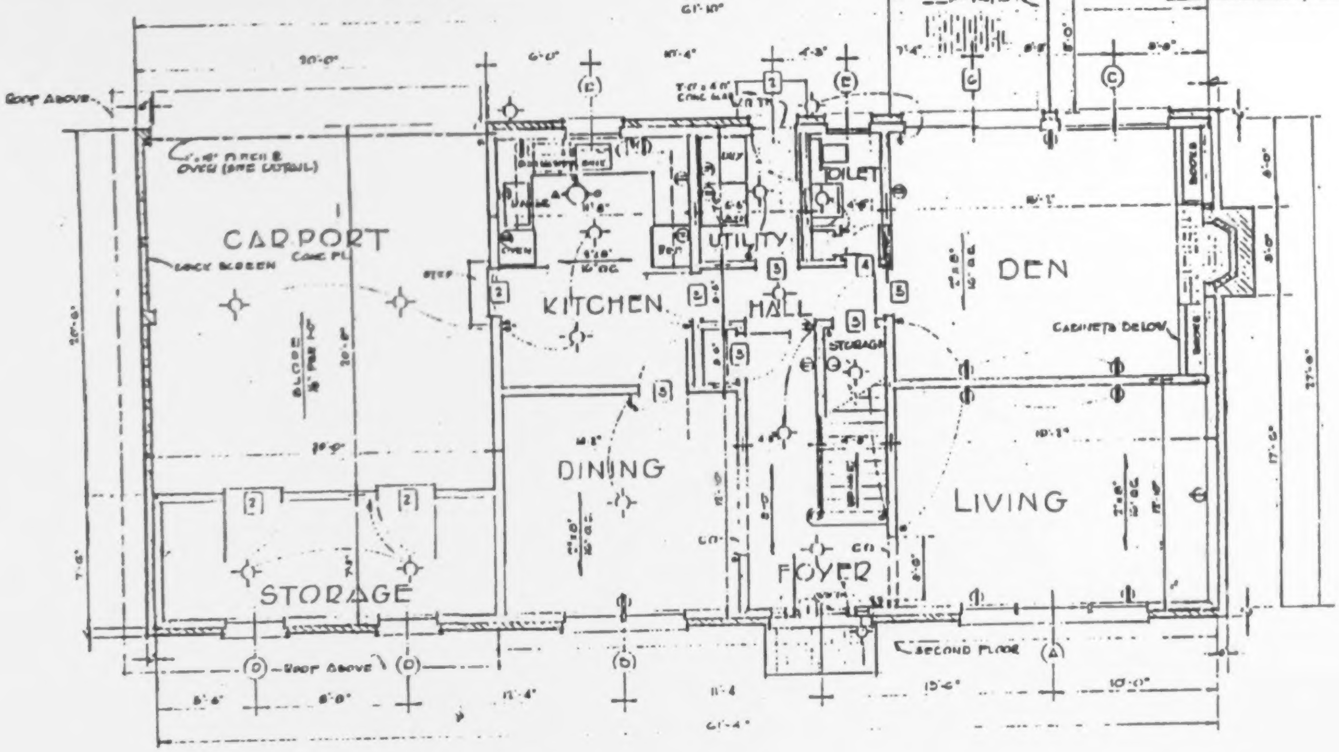
MATERIALS & FINISH SCHEDULE

NO	ROOM	FLOOR MATERIAL	FLOOR FINISH	BASE MATERIAL	BASE FINISH	WALLS MATERIAL	WALLS FINISH	CEILING MATERIAL	CEILING FINISH
1	DINING	OAK	VARNISH	WOOD	FLAT PAINT	GYPSUM BD	FLAT PAINT	GYPSUM BD	FLAT PAINT
2	FOYER	↓	↓	↓	↓	↓	↓	↓	↓
3	DEN	↓	↓	↓	↓	↓	↓	↓	↓
4	HALL	↓	↓	↓	↓	↓	↓	↓	↓
5	KITCHEN	V TILE	WAX	↓	↓	↓	↓	↓	↓
6	UTILITY	C TILE	NONE	C. TILE	NONE	↓	↓	↓	↓
7	TOILET	↓	↓	↓	↓	* ↓	↓	↓	↓
8	LIVING	OAK	VARNISH	WOOD*	FLAT PAINT	↓	↓	↓	↓

* C TILE WAINSCOT


CARPORT FLITCH PLATE


SECOND-FLOOR STUDS
DBL JOIST
BLOCKING
FIRST-FLOOR STUDS
FRAMING DETAIL SECOND-FLOOR WALL


ROOF ABOVE
CARPORT
DINING
KITCHEN
UTILITY
TOILET
HALL
STORAGE
DEN
CABINETS BELOW
LIVING
FOYER
STORAGE
ROOF ABOVE
SECOND FLOOR
61'-10"
61'-4"
30'-0"
15'-6"
10'-0"
11'-4"
8'-6"
8'-8"
27'-8"
20'-0"
7'-8"

FIRST-FLOOR PLAN

II-2-B-JS-1

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JOB SHEET

CARPENTRY

NAME______________________________ **DATE**________________________

UNIT: Floor Systems

NAME OF JOB: Install Strip Flooring over Concrete Slab

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(1)(G)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to lay reinforcement for a slab floor and construct a subfloor correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to lay strip flooring correctly.

TOOLS AND EQUIPMENT: 25 ft. steel tape, framing square, hammer, nail set, chalkline, power nailer, skill saw, hand saw, sawhorses, notched trowel, caulking gun, carpenter's pencil

MATERIALS: Nails, mastic, 15 lb. building paper, polyethylene film, sleeper material, concrete nails

GENERAL INSTRUCTIONS: This activity can be used as a simulated work task in any building trades program. Students can apply skills aquired in completing specified work task at a job site. Use blueprint furnished by instructor. Use proper safety precautions.

PROCEDURES AND/OR TASKS:

1. Assemble tools, equipment, and material needed.

2. Clean the slab and remove any dirt or material on the floor.
3. Use chalkline to snap chalklines 16" apart, run 90° from the finished floor.
4. Apply mastic on/over chalklines using manufacturer's recommendations.
5. A large bead of mastic on chalklines is usually sufficient.
6. Install 1" x 2" sleepers over the mastic, and nail in place with 1 1/2" concrete nails.
7. When using hardened nails, always wear eye protection.
8. Install 4 mil polyethylene film for vapor barrier, overlap 4" to 8", generally.
9. Nail another sleeper over plastic film, and nail down with 4d nails spaced 16" to 24" apart.
10. Install strip flooring over sleepers.
11. Snap chalkline to locate the first course parallel to sidewall.
12. Align the first strip on chalkline with grooved edge toward wall, and face nail close enough to cover nailhead with molding.
13. Blind nail tongue edge, 8d nail for 25/32" thickness, 5d for 1/2" thickness, or 4d for 3/8" thickness.
14. Drive nails at a 45° to 50° angle, and finish driving with nail set.
15. Blind nail tongue edge 10" to 12" apart using a power nailer.
16. Proceed to lay courses in similar manner; leave 1/2" expansion joint at the beginning and end of course.
17. Check measurement of space when flooring has been laid within 2 or 3 feet of wall to ensure flooring is parallel to wall.
18. If not parallel, dress grooved edge of succeeding courses slightly to bring final course parallel with wall.
19. Be sure joints of adjoining (side-by-side) strips do not occur between the space of the sleepers.
20. Have instructor check work.
21. Replace tools and materials.
22. Clean work area.

STUDENT INFORMATION SHEET

CARPENTRY

UNIT: Floor Systems

TOPIC: Plywood Subfloor

ESSENTIAL ELEMENT(S): (a)(7)(A)
(a)(7)(C)
(e)(1)(E)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to lay reinforcement for slab floors and construct subfloors correctly.

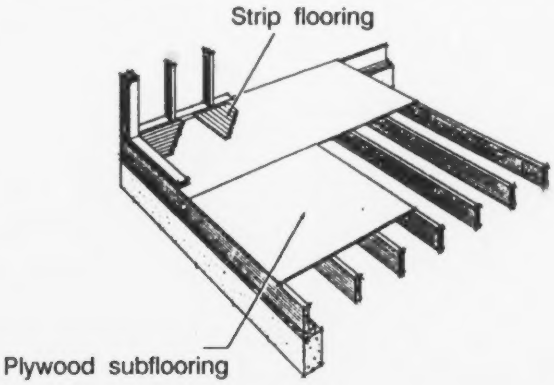
SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will construct a plywood subfloor system correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used when constructing floor systems will include mathematics and reading concepts and skills.*

PLYWOOD SUBFLOORS

Some panels are used as a combined subfloor and underlayment, and are made of interior type plywood, tongue-and-groove, and are 1 1/8" thick. The panels are placed over two supporting beams on 48" centers.

The standard tongue-and-groove panels measure 4′ x 8′ on the face; with extra for the tongue.



Several support systems can be used with this floor system if beams are on 48" O.C. (on center). One method is the box system using 4" beams or 2" joists nailed together. If solid lumber beams are used, they should be kept as dry as possible to prevent warpage and shrinkage.

The tongue-and-groove subfloor should be started with the tongue to the outside of the building. The pounding, if needed to set the joints, can be done by using a piece of scrap 2" x 4" laid against the groove side. The grain of the panels should run across the main beams when nailed down, and the end joints should be staggered.

To achieve the best resistance to nail popping and maximum withdrawal strength, use 8d common ring-shanked or helically-threaded nails. Space nails on 6" O.C. on all bearing points; set the nails at least 1/8" but do not fill (set means to drive the heads below the wood surface).

When using tongue-and-groove panels, one line of nails will hold both panels at the end of each panel.

The plywood subflooring will allow you to lay strip flooring in any direction because of the smooth surface. If the floor covering is a thin, resilient type, be sure to fill any cracks 1/16" or wider and sand them smooth.

ASSIGNMENT SHEET

CARPENTRY

NAME_______________________________ **DATE**_________________________

UNIT:	Floor Systems
TOPIC:	Plywood Subfloor
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (e)(1)(E)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to lay reinforcement for slab floors and construct subfloors correctly.
SPECIFIC OBJECTIVE(S):	After completing this assignment sheet, the student(s) will construct a plywood subfloor system correctly.
REFERENCES:	II-2-C-IS B.T.I-Unit III
DIRECTIONS:	Read and answer the following questions in the space provided.

1. Subfloor plywood should be made of what type plywood?

2. Why should solid lumber beams be kept dry?

3. How should the tongue-and-groove panel be laid to start a floor?

4. If a panel needed to be pounded to set it, what would you do?

5. Which way should the grain of the panel run when being laid?

6. What type nails should be used to prevent nail popping?

7. How should nails be spaced on bearing points?

8. What is meant by setting the nail head?

9. Why could you lay strip flooring in any direction with a plywood floor?

10. What would need to be done to a plywood subfloor before laying a thin type floor covering?

JOB SHEET

CARPENTRY

NAME______________________________ **DATE**________________________

UNIT:	Floor Systems
NAME OF JOB:	Tongue and Groove Subfloor
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(1)(G)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to lay reinforcement for a slab floor and construct a subfloor correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to construct a plywood subfloor correctly.
TOOLS AND EQUIPMENT:	Hammer, 25 ft. measuring tape, framing square, skill saw, chalkline, sawhorses, safety equipment
MATERIALS:	Tongue-and-groove plywood, 8d nails
GENERAL INSTRUCTIONS:	Plywood produces a smooth, solid, stable base for any type of finished flooring. Use drawings provided by instructor to estimate material needed for project. Project should be on job site or made up to simulate one in shop setting. Use proper safety precautions.

PROCEDURES AND/OR TASKS:

1. Use drawing or measure with steel tape; determine the overall length of the subfloor from edge joist to edge or from side stud to side stud. This will determine the most economical cut for split sheets.
2. Check stock for warpage. Set badly warped pieces aside for less important use.

3. Begin at a corner with a full sheet as shown on the information sheet, page 53. Set long edge flush with header joist in platform framing, or with front studs in ballon framing. Center the short edge over a joist. The outer, short edge should be flush with the edge joist or side studs. Using tongue-and-groove plywood, lay the grooved edge flush with the edge joist.

4. Attach plywood by nailing at the four corners with 8d nails. Using tongue-and-groove plywood, nail only at the two outer corners.

5. Attach the first sheet of plywood with nails, nailing every 6" across short edges and every 10" to 12" along long edges and into joist under middle of the sheet.

6. Fit and attach another full sheet along the header joist. (**NOTE:** Never pound on the edge of a sheet; instead, use a piece of scrap 2" x 4" held against the edge.)

7. Rip a full sheet to length established in step 1.

8. Lay and attach full sheet and partial sheet, which is the remainder of sheet cut.

9. Continue to lay subflooring in this diagonal pattern, with full sheets in each row, alternating full sheets and partial sheets down the edge joist.

10. Use 2" x 4" blocking under unsupported edges between joists, if necessary, after each sheet is laid.

11. At large openings, carry subflooring into the opening and cut off with power saw. Cut sheet immediately after sheet is attached to prevent someone from falling through the unsupported subfloor at the opening.

12. For small openings, such as for ducts and pipes not yet installed, lay subflooring right over the opening.

13. If ducts and pipes are already installed and rise above the level of the joists, locate and precut holes in the sheet before laying and attaching it.

14. At opposite edges of the floor, let subflooring overlap the sill. Use a power saw to trim excess so that it is flush with sill members.

15. Have instructor check work and evaluate.

STUDENT INFORMATION SHEET

CARPENTRY

UNIT:	Stair Systems
TOPIC:	Stairway Parts
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (e)(1)(I)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct stairway systems correctly.
SPECIFIC OBJECTIVE(S):	After completing this information sheet, the student(s) will identify and state the purpose of stairway parts correctly.
BASIC ACADEMIC SKILLS APPLICATION:	*Basic academic skills used when constructing stair systems will include reading concepts, oral and written communications, and mathematics.*

INFORMATION

The **run** of a stairway is the horizontal length from one end to the other. The **flight** is the same as the slope of the stairs. This is not a measurement but refers to the continuous steps from one platform to another. The vertical height from one finished floor to another finished floor is the **rise**.

The **tread** is the horizontal face of the step or the part you step on. **Risers** are the vertical dimensions from tread to tread. The **nosing** or **nose** of a tread is the part that overlaps a riser. A **nosing line** is an imaginary diagonal line along the nosing.

The **stringers** and **carriages** support the treads and risers. Narrow stairs have two stringers, and wide stairs have a third stringer in the center. The **landing** is the platform that separates a flight of steps and supports one end of stringers.

If a stairway turns without a landing, the stair treads are not rectangular but wedge-shaped and are called **winders.**

The **handrail** is required on most stairways and decks. Handrails may be attached to the walls or supported on vertical members called **balusters**. The **balustrade** is a combination of the balusters and handrail. The **newel post** is the main support for the end of the balustrade, at the lower end or at a landing. The purpose is not only to support but to stiffen the balustrade. (See TM-3 for stairway parts.)

The **headroom** is the space located above the stairs.

The **glue block** is a small block glued and then nailed to the back of the tread and riser.

The **total rise** of the stairs is the distance from one finished floor to the other finished floor.

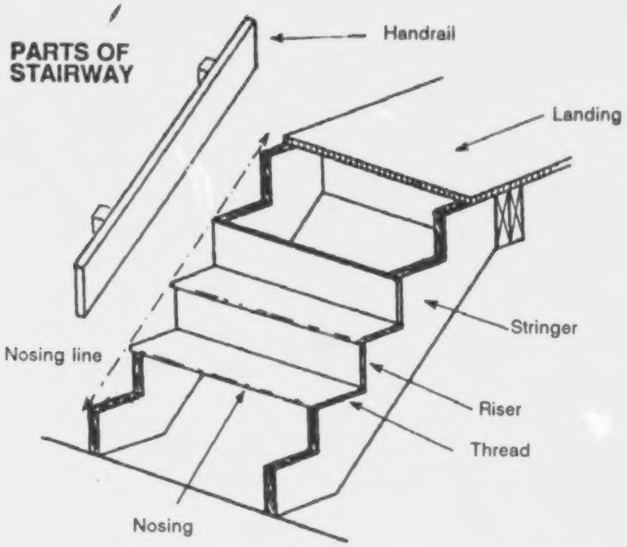
The **total run** is the horizontal dimension from one end of the stringer to the other end.

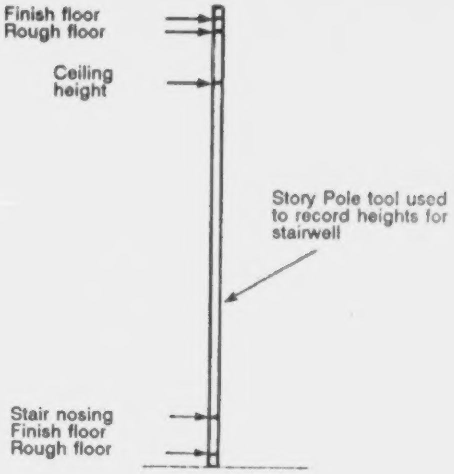
STAIRS

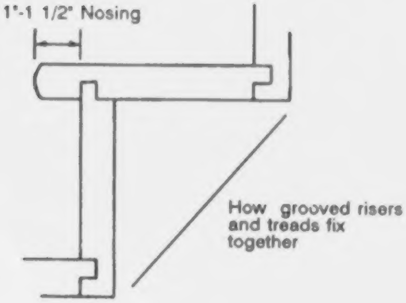
Treads are for the main stairs and are usually made of 1 1/4-inch materials, though service stairs are usually made of 2 x 12s. The risers are usually made from 3/4-inch material. The most common materials used for main stairs are birch and oak, while white southern pine is used mostly for service stairs.

There are several ways to connect treads to risers, or risers and treads to the stringers. The most common methods are rabbet joints, butt joints, and miter joints. If the rabbet joint is used, a groove is cut along the nosing of the tread and the joint is cut at the base of the tread. When using a butt joint, the riser will be butted into the tread. When a mitered riser and tread are used, a tight joint is made and used with a mitered stringer.

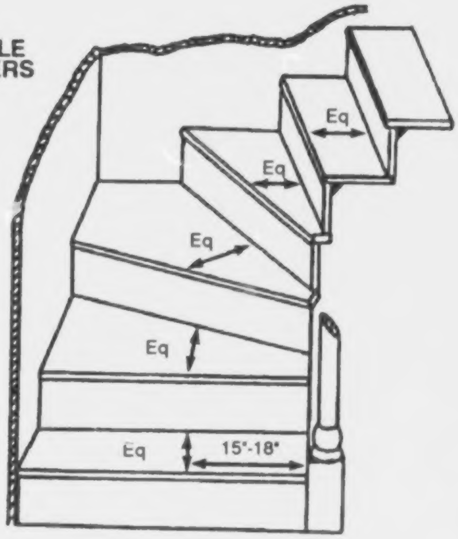
PARTS OF STAIRWAY


Handrail
Landing
Stringer
Nosing line
Riser
Thread
Nosing

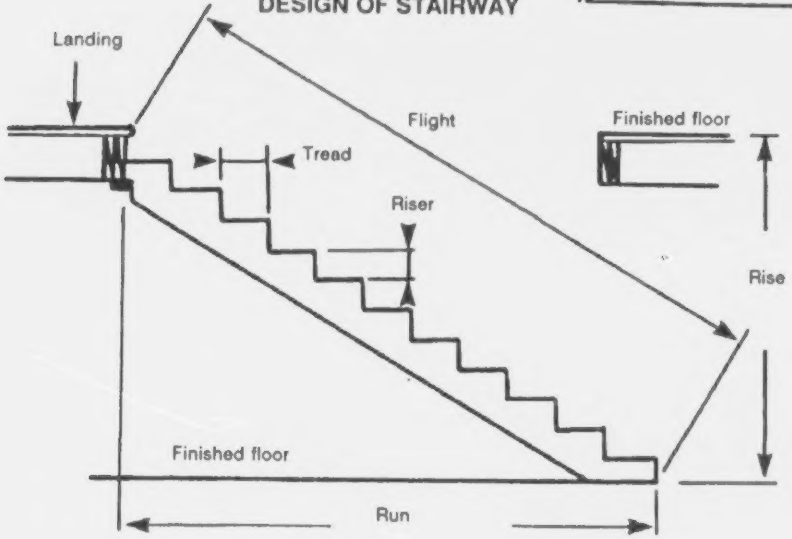

Finish floor
Rough floor
Ceiling height
Story Pole tool used to record heights for stairwell
Stair nosing
Finish floor
Rough floor


1"-1 1/2" Nosing
How grooved risers and treads fix together

SAFETY RULE FOR WINDERS


Eq
Eq
Eq
Eq
Eq
15"-18"

DESIGN OF STAIRWAY


Landing
Flight
Tread
Riser
Finished floor
Rise
Finished floor
Run

TM-3

ASSIGNMENT SHEET

CARPENTRY

NAME________________________________ **DATE**__________________________

UNIT: Stairway Systems

TOPIC: Stairway Parts

ESSENTIAL ELEMENT(S): (a)(7)(A)
(a)(7)(C)
(e)(1)(I)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct stairway systems correctly.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will identify and state the purpose of stairway parts correctly.

REFERENCES: II-3-A-IS
B.T. I-Unit III

DIRECTIONS: Read and answer the following questions in the space provided.

1. The run of a stairway is ________________ length from one end to the other end.

2. The vertical height from one finished floor to the other finished floor is called the ________________.

3. The nose of a tread is the part that overlaps the _____________.

4. The ____________ and _____________ support the treads and risers.

5. The _______________ is the platform that separates a flight of steps.

6. If there is no landing and the steps are wedge-shaped, they are called _____________.

7. A _____________ is required on most stairways.

8. The balusters and the handrail combination is called the _____________.

9. The _____________ post is the main support for the end of the balustrade.

10. Using TM-3, draw a sketch of the parts of a stairway making each tread 1". When completed, give to instructor to check.

11. If a set of steps is five risers high and each riser is 7 1/4 inches, what is the total rise of the steps? ___________

12. A 2" x 6" x 16′ board contains how many board feet? ___________

13. A 1" x 4" x 6′ board contains how many board feet? ___________

14. A flight of 27 stairs has 4 risers, each 7 7/8 inches high. What is the total rise of the stairs? _________

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JOB SHEET

CARPENTRY

NAME________________________ **DATE**____________________

UNIT:	Stair Systems
NAME OF JOB:	Estimating Materials for Stairs
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(1)(G)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct stairway systems correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to identify and state the purpose of stairway parts and their cost correctly.
TOOLS AND EQUIPMENT:	Calculator, pencil, tape measure, 12" scale
MATERIALS:	Paper, blueprints
GENERAL INSTRUCTIONS:	This can be used as a simulated work task in any building trades program. Student(s) can apply skills aquired in completing specified job task at a job site. Using blueprints, estimate the amount of material needed to construct the stairway. Contact local lumber yard for prices.

PROCEDURES AND/OR TASKS:

1. Decide on scale used on drawing, and measure all dimensions.

2. Using prices from lumber yard, determine cost of material to be used in stairway.

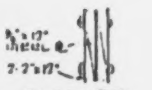
3. Make a list of materials to be used.

4. Have instructor check and evaluate work.

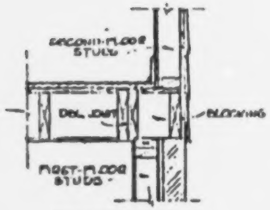
MATERIALS & FINISH SCHEDULE

NO	ROOM	FLOOR		BASE		WALLS		CEILING	
		MATERIAL	FINISH	MATERIAL	FINISH	MATERIAL	FINISH	MATERIAL	FINISH
1	DINING	OAK	VARNISH	WOOD	FLAT PAINT	GYPSUM BD	FLAT PAINT	GYPSUM BD	FLAT PAINT
2	FOYER	↓	↓	↓	↓	↓	↓	↓	↓
3	DEN	↓	↓	↓	↓	↓	↓	↓	↓
4	HALL	↓	↓	↓	↓	↓	↓	↓	↓
5	KITCHEN	V. TILE	WAX	↓	↓	↓	↓	↓	↓
6	UTILITY	C. TILE	NONE	C. TILE	NONE	↓	↓	↓	↓
7	TOILET	↓	↓	↓	↓	*	↓	↓	↓
8	LIVING	OAK	VARNISH	WOOD	FLAT PAINT	↓	↓	↓	↓

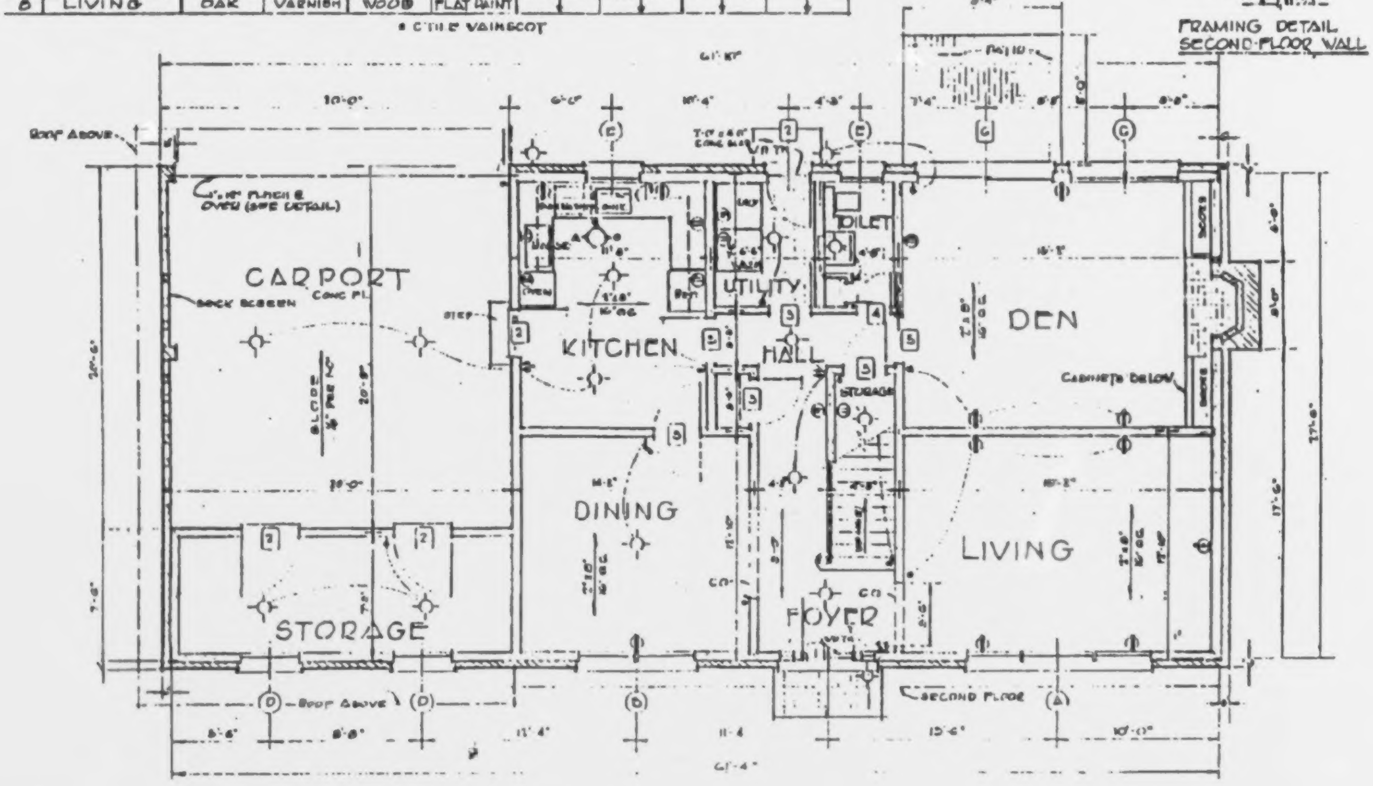
* C. TILE VAINSCOT



CARPORT FLITCH PLATE


SECOND-FLOOR STUDS
BLOCKING
FIRST-FLOOR STUDS

FRAMING DETAIL SECOND-FLOOR WALL


ROOF ABOVE
CARPORT
CONC. FL.
BRICK SCREEN
STORAGE
KITCHEN
UTILITY
TOILET
HALL
STORAGE
DEN
CABINETS BELOW
DINING
FOYER
LIVING
ROOF ABOVE
SECOND FLOOR
10'-0"
6'-0"
4'-8"
8'-4"
8'-6"
13'-4"
11'-4
15'-6"
10'-0"

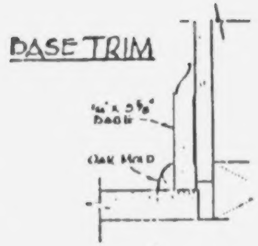
FIRST-FLOOR PLAN

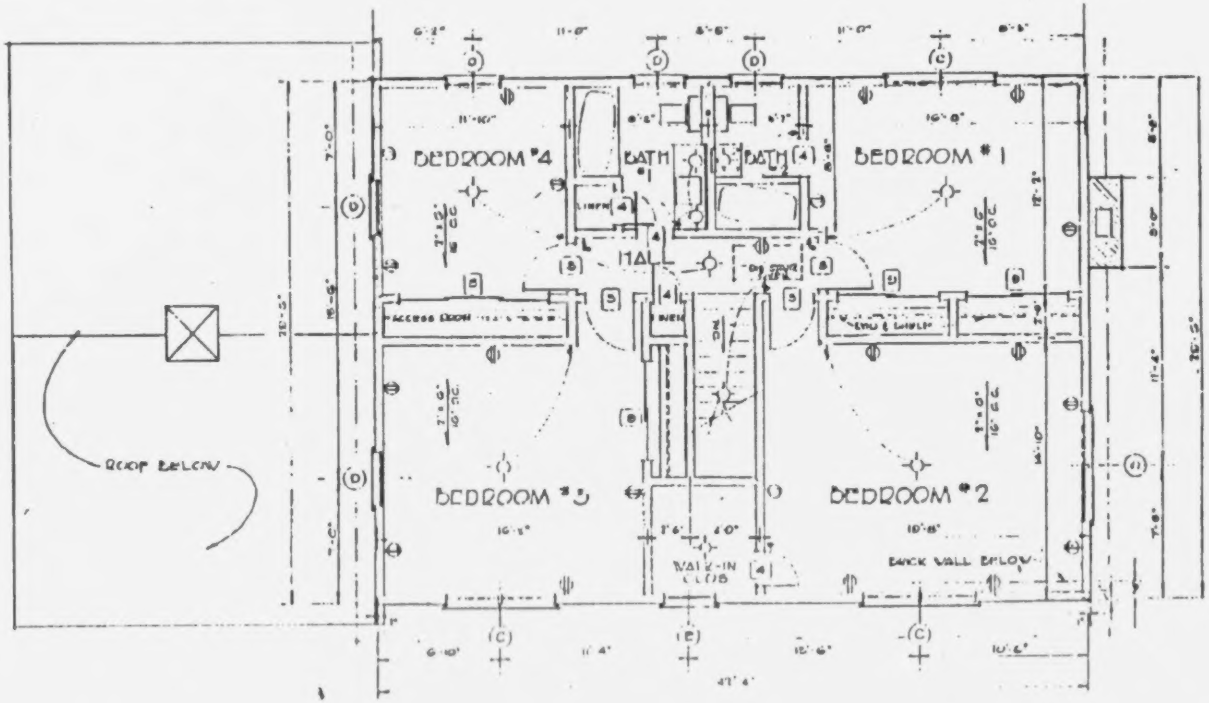
BEST COPY AVAILABLE

MATERIALS & FINISH SCHEDULE

NO	ROOM	FLOOR		BASE		WALLS		CEILING	
		MATERIAL	FINISH	MATERIAL	FINISH	MATERIAL	FINISH	MATERIAL	FINISH
1	BEDROOM #1	OAK	VARNISH	WOOD	FLAT PAINT	GYPSUM BD	FLAT PAINT	GYPSUM BD	FLAT PAINT
2	BEDROOM #2	↓	↓	↓	↓	↓	↓	↓	↓
3	BEDROOM #3	↓	↓	↓	↓	↓	↓	↓	↓
4	BEDROOM #4	↓	↓	↓	↓	↓	↓	↓	↓
5	CLOSETS	↓	↓	↓	↓	↓	↓	↓	↓
6	HALL	↓	↓	↓	↓	↓	↓	↓	↓
7	BATH #1	CER TILE	NONE	CER TILE	NONE	* ↓	↓	↓	↓
8	BATH #2	↓	↓	↓	↓	* ↓	↓	↓	↓

* CER TILE VAINSCOT


BASE TRIM
1/2" x 3 5/8" BASE
OAK MOLD


BEDROOM #4
BATH #1
BATH #2
BEDROOM #1
HALL
LINEN
ACCESS DOOR
DN
BEDROOM #3
BEDROOM #2
WALK-IN CLOS
ROOF BELOW
BRICK WALL BELOW
6'-2"
11'-0"
8'-6"
11'-0"
8'-6"
11'-10"
16'-0"
6'-10"
11'-4"
12'-6"
10'-6"
47'-4"
16'-2"
10'-8"
26'-3"
(C)
(D)
(E)

SECOND-FLOOR PLAN

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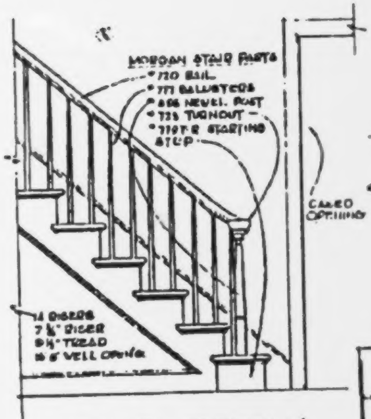
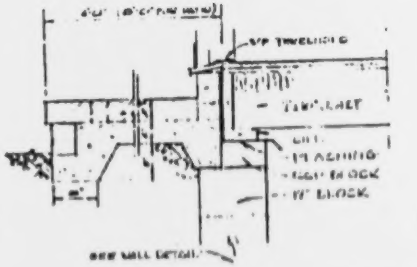
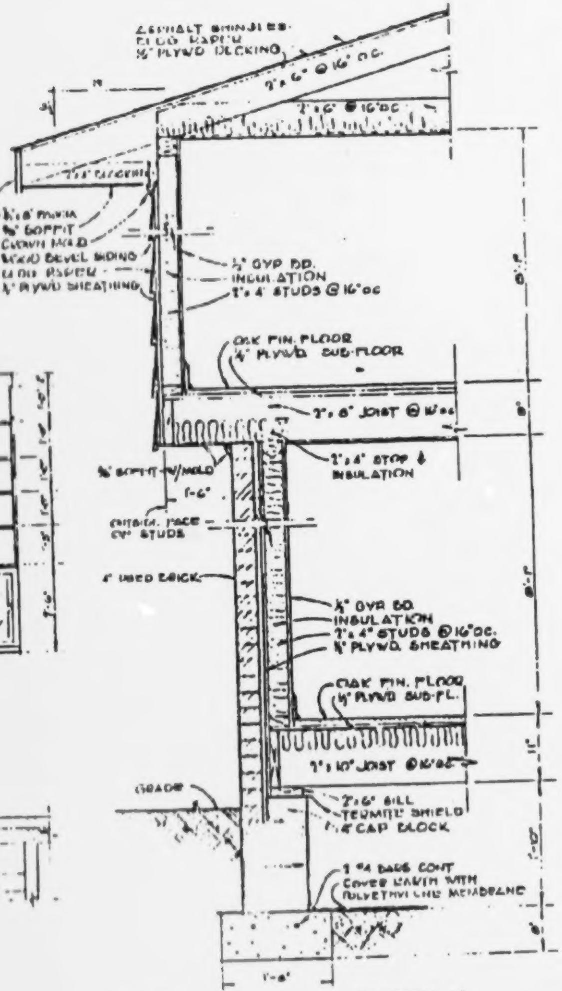

MORGAN STAIR PARTS
*720 RAIL
*771 BALUSTERS
*886 NEWEL POST
*735 TURNOUT
*7107-R STARTING STEP
CASED OPENING
14 RISERS
7 ½" RISER
9 ½" TREAD
10'-6" WELL OPENING

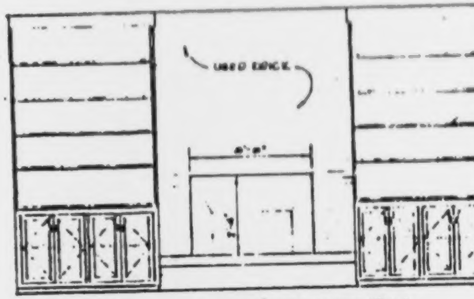
STAIR DETAIL


4'-0" (8'-0" PER WIDTH)
5/8" THRESHOLD
TERR. SLAB
SILL
FLASHING
CAP BLOCK
8" BLOCK
SEE WALL DETAIL

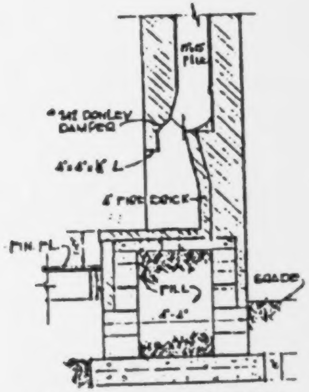
FRONT STEP DETAIL


ASPHALT SHINGLES
FELT PAPER
½" PLYWD DECKING
2" x 6" @ 16" O.C.
2" x 6" @ 16" O.C.
2" x 8" FASCIA
⅜" SOFFIT
CROWN MOLD
WOOD BEVEL SIDING
FELT PAPER
½" PLYWD SHEATHING
½" GYP. BD.
INSULATION
2" x 4" STUDS @ 16" OC
OAK FIN. FLOOR
½" PLYWD SUB-FLOOR
2" x 8" JOIST @ 16" OC
⅜" SOFFIT W/MOLD
1'-6"
2" x 4" STOP & INSULATION
OUTSIDE FACE OF STUDS
4" USED BRICK
½" GYP. BD.
INSULATION
2" x 4" STUDS @ 16" OC.
½" PLYWD. SHEATHING
OAK FIN. FLOOR
½" PLYWD SUB-FL.
2" x 10" JOIST @ 16" OC
GRADE
2" x 6" SILL
TERMITE SHIELD
CAP BLOCK
2 #4 BARS CONT.
COVER EARTH WITH POLYETHYLENE MEMBRANE
1'-8"

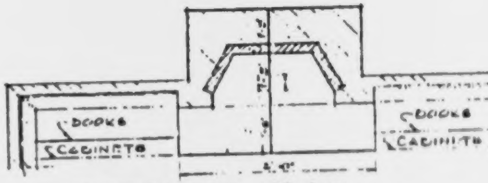
FRONT WALL DETAIL


USED BRICK
4'-0"

FIREPLACE ELEVATION


FLUE
*341 DONLEY DAMPER
4" x 4" x ⅜" L
4" FIRE BRICK
FIN. FL.
FILL
4'-4"
GRADE

FIREPLACE SECTION


BOOKS
CABINETS
BOOKS
CABINETS
4'-0"

FIREPLACE PLAN

71

II-3-A-JS-1

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STUDENT INFORMATION SHEET

CARPENTRY

UNIT: Stairway Systems

TOPIC: Open Stairway

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(e)(1)(I)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct stairway systems correctly.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to construct an open stairway correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used when constructing stair systems will include reading concepts, oral and written communications, and mathematics.*

OPEN STAIR SYSTEM

An open stair system is one that is open on both sides or on one side and requires a decorative enclosure and support for the handrail. Most designs consist of an assembly of parts called a balustrade. The main parts of a balustrade are newels, balusters, and rails. Usually, these parts are made and assembled on the job by a carpenter.

The starting newel has to be secured and anchored either to the top step or through the floor and secured to a beam. Balusters are joined to the stair treads using a round or square mortise. There can be two or three balusters mounted on each tread.

RAILINGS

Stairways always have rails that extend from one floor to the next. The closed stairways have rails mounted on brackets on the walls and should be set 30 inches over the tread at the riser line and 34 inches above the floor at the landing.

The open stairways have handrails and balusters for open areas around the stairs. The handrails end against the newel post. The stairs should be laid out so that you can use stock parts for goosenecks, rails, newels, and balusters. The balusters are doweled and dovetailed into the treads and sometimes covered by a return nosing. The dovetails are shaped on the lower ends of the balusters, and the dovetail recesses the corresponding sizes which are cut in the end sections of the treads.

Newel posts should always be firmly anchored. Where the half newels are attached to the wall, a blocking should be used when the wall is framed out.

ASSIGNMENT SHEET
CARPENTRY

NAME______________________________ **DATE**________________________

UNIT: Stairway Systems

TOPIC: Open Stairway

ESSENTIAL ELEMENT(S): (a)(7)(A)
(a)(7)(C)
(e)(1)(I)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct stairway systems correctly.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will be able to construct an open stairway correctly.

REFERENCES: II-3-B-IS
B.T. I-Unit III

DIRECTIONS: Read and answer the following questions in the space provided.

1. Open stair systems can be open on ______________ or one side.
2. Most stairways require a ____________ on each side.
3. The newel has to be ________________ for support.
4. The balusters are connected to the tread with a round or square ____________.
5. There can be ______________ mounted on each tread.
6. The main parts of a balustrade are newels, balusters, and _________________.

JOB SHEET
CARPENTRY

NAME______________________________ **DATE**________________________

UNIT:	Stairway Systems
NAME OF JOB:	Drawing Open Stairway
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (e)(1)(I)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct stairway systems correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to construct an open stairway correctly.
TOOLS AND EQUIPMENT:	Sharp pencil, fractional rule
MATERIALS:	11 1/2" x 20" graph paper, TM-1 stairway detail from student manual.
GENERAL INSTRUCTIONS:	Draw detail using 1 inch equals 1 foot, and label. All dimensions should be on grid when complete.

PROCEDURES AND/OR TASKS:

1. Collect materials needed to do this task.
2. Draw detail to scale size.
3. When complete, give to the instructor.

STUDENT INFORMATION SHEET
CARPENTRY

UNIT: Stairway Systems

TOPIC: Stair Layout

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(e)(1)(I)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct stairway systems correctly.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to design a stair layout correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used when constructing stair systems will include reading concepts, oral and written communications, and mathematics.*

LAYOUT INFORMATION

The blueprints on most residences with stairs will have a section or detail showing the dimension of the stairway as shown in TM-3.

The carpenter should always check the dimensions using these formulas.

The total rise = height of a riser x number of risers.

Number of risers = total rise/height of a riser.

The horizontal dimensions can be checked by:

total run = width of a tread x number of treads.

Number of treads = total run/width of a tread.

The carpenter should lay out the stairway on paper to see if it meets code requirements. This should be done before construction begins.

To determine the length of a stairwell opening, use the formula:

well opening = tread width/riser height x R.

R equals required headroom plus the total height of upper floor construction, including the finish materials.

The sections and details will show any special conditions such as landings, headroom, and winders that are not normally shown on the blueprint. Using the formulas above will help carpenters to check vertical, horizontal, and length dimensions.

A carpenter would need to use a sheet of graph paper, a steel-edged ruler, and a sharp pencil. By drawing a layout of the stairs to be built, the carpenter can be sure the stairs will fit after construction has begun.

The drawing should be as large as possible on the graph paper. If the graph paper has 1/8-inch squares, each square can represent 1" of the actual dimension. If this scale is used, the paper should be 15" x 20".

If only 8 1/2" x 11" paper is available, use 3/4" = 1'-0". Then, the 1/8" square will equal 2" of the actual dimension, and the 1/4" square would equal 4".

ASSIGNMENT SHEET
CARPENTRY

NAME________________________________ **DATE**__________________________

UNIT:	Stairway Systems
TOPIC:	Stair Layout
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (e)(1)(I)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct stairway systems correctly.
SPECIFIC OBJECTIVE(S):	After completing this assignment sheet, the student(s) will be able to design a stair layout correctly.
REFERENCES:	II-3-C-IS B.T. I-Unit III
DIRECTIONS:	Read and answer the following questions in the space provided.

1. How are stair dimensions shown for clarification?

2. Why should a carpenter check blueprint dimensions?

3. The total rise of the stairs can be checked by what formula?

4. The horizontal dimensions can be checked by what formula?

5. A carpenter should lay out a stairway on paper to see if it meets what requirements?

6. The length of a stairwell opening can be determined with what formula?

JOB SHEET

CARPENTRY

NAME________________________________ **DATE**__________________________

UNIT:	Stairway Systems
NAME OF JOB:	Building An Open Stairway
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(1)(G)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct stairway systems correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to construct an open stairway correctly.
TOOLS AND EQUIPMENT:	Framing square, 25 ft. tape measure, handsaw, sawhorses, stair gauge, metal clamps for framing square, skill saw
MATERIALS:	2" x 12" material as required
GENERAL INSTRUCTIONS:	This activity can be used as a simulated work task in any building trades program. Student(s) can apply skills aquired in completing specified job task at a job site. Open stringers are the most common type stringer used for stairways. The open stringer is usually cut from 2" x 12" material. The treads and risers are then attached. Determine material needed, then check with lumber yard for material prices to determine what to charge the customer. Use formulas for stairs on page 225 in the appendix. Use proper safety precautions.

PROCEDURES AND/OR TASKS:

1. The total rise of the stair needs to be determined. To find the total rise, use a story pole placed in the well opening. The top of the story pole is marked flush with the top of the finished floor to determine the distance between floors. A tape is used to measure the distance from the end of the story pole to the mark to determine the total rise.

2. Calculate the riser height. The plans should show riser height, but you should always recheck to make certain they are correct.

3. Set dividers to show desired riser height and measure the total rise on the story pole, riser by riser. Then, adjust dividers and measure the distance again if the riser height is not exactly right. Repeat until story pole is divided into equal parts.

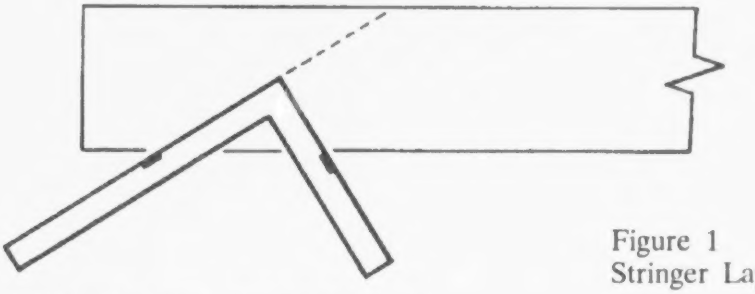
4. Use riser height to mark the tongue of the framing square and place a stair gauge at the proper location. The stair gauge fits on the framing square and assures accurate layout work.

5. Locate the tread width on the blade of the framing square and place a stair gauge at the proper location.

6. Place 2" x 12" stringers on two sawhorses.

7. Start at one end of the stringer, place the framing square in position, and mark the tread and riser cut. The first tread line should extend completely across the stringer as shown in Figure 1.

First tread cut extends
across stringer



This part of the stringer will rest on the floor

Figure 1
Stringer Layout

8. Move the square up the stringer, placing the stair gauge against the top of the first riser. Mark the first tread and the second riser. Be sure to use a sharp pencil or knife when doing layout work.

9. Mark the remainder of the treads and risers on the stringers.

10. Cut the treads and risers first with an electric saw, then finish cut with a handsaw. A plane may be used to trim the tread and riser cuts.

11. Place the stringers in position and secure them to the header.

12. Place risers in position and secure them with 8d finishing nails.

13. Place the treads in position and secure them with 8d finishing nails. When treads and risers are in place, the riser should be nailed to the tread from the back of the stair.

14. Place and secure glue blocks.

15. Have instructor check work and evaluate.

16. Replace tools and materials.

17. Clean work area.

STUDENT INFORMATION SHEET
CARPENTRY

UNIT:	Stairway Systems
TOPIC:	Semihoused Stringers
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (e)(1)(I)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct stairway systems correctly.
SPECIFIC OBJECTIVE(S):	After completing this information sheet, the student(s) will be able to construct the semihoused stringers correctly.
BASIC ACADEMIC SKILLS APPLICATION:	*Basic academic skills used when constructing stairway systems will include reading concepts, oral and written communications, and mathematics.*

SEMIHOUSED STRINGERS

These stringers rise and run as stair carriages, but are cut in reverse direction. The risers are butted and nailed to the riser cuts of wall stringers. The stringers and risers are laid over the carriage, then adjusted so the tread cuts of stringers fit the tread cuts of the carriage. The treads are then nailed to the tread cuts of the carriage and butted to the stringers. (See TM-4.)

An advantage of having two stringers connected with the risers is it keeps the stringers from spreading and exposing the joint at the end of the treads. When risers are nailed to stringers, there is no need to nail the risers to the carriage. This type stringer is sometimes used when carriages are permanently fitted to the bridgework when framing the building.

Sometimes treads run under the tread cut of a stringer. In this case, the tread will be notched at the nosing to fit over the stringer.

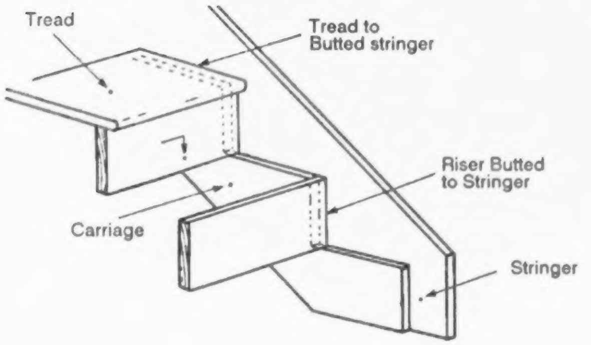
This type of construction may squeak when stairs are stepped on. Due to shrinkage of the building frame, the joints may open and become unsightly.

These stringers should be cut from 2-inch material and should be wide enough to cover the tread and riser cut in the stringers and reach 2 inches beyond the tread nosing, usually 12 to 14 inches.

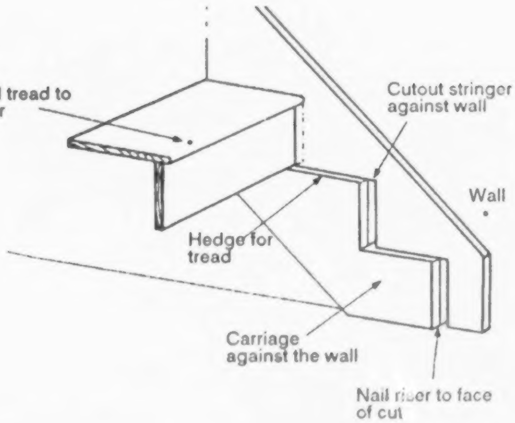
In the layout of the finish stringer, only the level cut for the floor, plumb cut for the header, and the plumb cuts for the top and bottom of the stringer are cut.

This type stringer is preferred when the treads and risers are to be nailed to the stringers. It is sometimes used when rough stringers are temporarily fitted and the bridgework is framed.

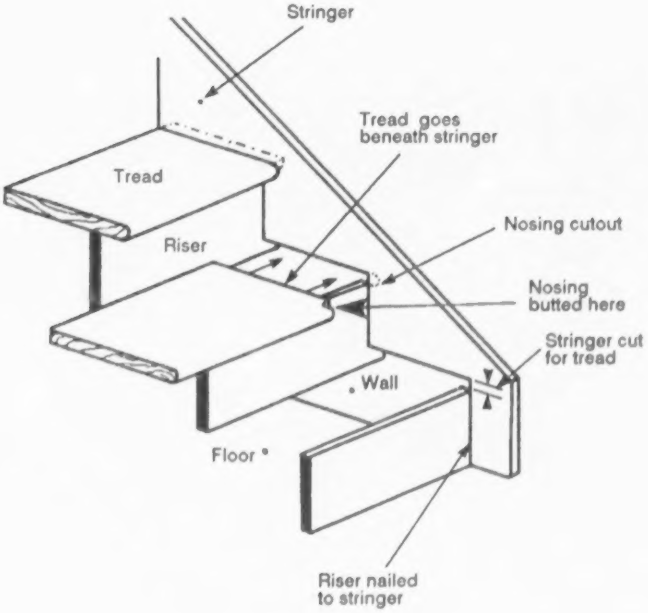
SEMIHOUSED STRINGER


Tread
Tread to Butted stringer
Riser Butted to Stringer
Carriage
Stringer

CUTOUT STRINGER


Nail tread to riser
Cutout stringer against wall
Wall
Hedge for tread
Carriage against the wall
Nail riser to face of cut

NOTCHED TREADS


Stringer
Tread goes beneath stringer
Tread
Riser
Nosing cutout
Nosing butted here
Stringer cut for tread
Wall
Floor
Riser nailed to stringer

ASSIGNMENT SHEET

CARPENTRY

NAME________________________________ DATE___________________________

UNIT:	Stairway Systems
TOPIC:	Semihoused Stringers
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (e)(1)(I)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct stairway systems correctly.
SPECIFIC OBJECTIVE(S):	After completing this assignment sheet, the student(s) will be able to construct the semihoused stringers correctly.
REFERENCES:	II-3-D-IS B.T. I-Unit III
DIRECTIONS:	Read and answer the following questions in the space provided.

1. How are the semihoused stringers laid out and cut?

2. What is the advantage of having two stringers connected with risers?

3. Using TM-4, use the scale and sketch to label the semihoused stringer.

4. Using TM-4, use the scale and sketch to label the cutout stringer.

5. Using TM-4, use the scale and sketch to label the notched stringer.

After completing questions 3, 4, and 5, give to instructor for evaluation.

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JOB SHEET
CARPENTRY

NAME______________________________ **DATE**________________________

UNIT: Stairway Systems

NAME OF JOB: Install Disappearing Stairs

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(e)(1)(I)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct stairway systems correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to construct the disappearing stair system correctly.

TOOLS AND EQUIPMENT: Hammer, steel tape measure

MATERIALS: Disappearing stair kit from manufacturer

GENERAL INSTRUCTIONS: The staircase will install into the ceiling between joists. When not in use, it will fold up and fit in opening in ceiling. The stairs are opened by pulling on a short pull rope hanging from the ceiling enclosure.

PROCEDURES AND/OR TASKS:

1. Gather equipment and materials needed for task.

2. Use measurement from literature or measure the unit being installed.

3 Determine the size of opening in the ceiling.

4. Measure the opening for size and check for square.

5. Get a helper when installing stair frame in the ceiling to help to hold tight against the ceiling.
6. Working in the attic, nail sides and frame into the header and trimmers.
7. If needed in some cases, shim one side and end if necessary.
8. After nailing frame in place, check stairway operation.
9. Be sure stairway opens and closes smoothly.
10. Have instructor check work.
11. Replace tools and materials.
12. Clean work area.

STUDENT INFORMATION SHEET
CARPENTRY

UNIT: Wall Systems

TOPIC: Story Pole

ESSENTIAL ELEMENT(S): (a)(7)(A)
(a)(7)(C)
(e)(1)(E)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct bearing partitions, nonbearing partitions, and metal frames correctly.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to use a story pole for measurements to construct a wall system correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used when constructing wall systems will include reading concepts and skills, oral and written communications, and mathematics.*

INFORMATION

The story pole is an instrument made by the carpenter using a long 2" x 4" or 1" x 4". The markings on it represent the actual wall frame. The marks are made at the proper height for every horizontal part of the wall frame.

It is much more practical to check the story pole when a dimension is needed than to stop and look at the blueprints each time. This is time-consuming, and errors are more likely to occur. The carpenter should double-check the marking to ensure the correct measurements.

The story pole is very useful for residential construction and is a must when constructing split-level homes because of the number of stud lengths and heights to remember. The dimensions are taken from the blueprints. (See TM-5.)

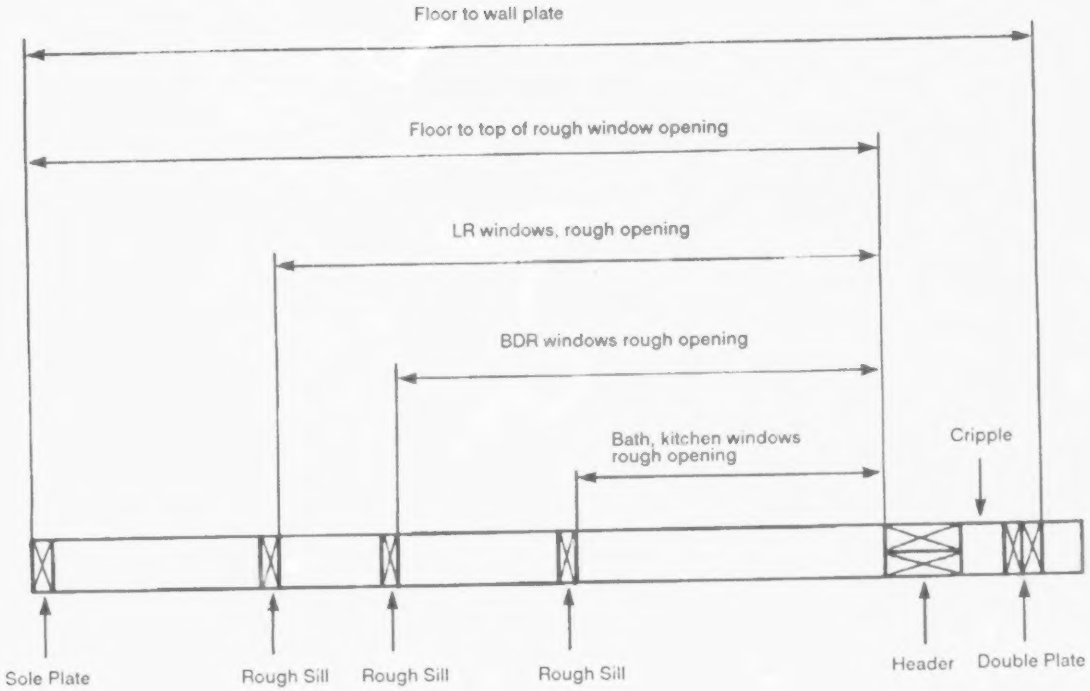
MASTER STUD PATTERN

The master stud pattern is similar to the story pole, but has less information. A 1" x 4" or 2" x 4" can be used to lay out dimensions.

First, lay out the distance from rough floor to the ceiling. Next, lay out the header (when several sizes of headers are used, they can be marked on top of each other). Then, lay out rough openings, measuring down from the bottom side of the header, and draw in a roughsill.

Various stud lengths, cripple, trimmer, and regular lengths can be taken from the full-size layout.

When laying out door heights, use the other side of the pattern to keep them separate. When working on a split-level or a multiple story, one pattern should be made for each floor.


Floor to wall plate
Floor to top of rough window opening
LR windows, rough opening
BDR windows rough opening
Bath, kitchen windows rough opening
Cripple
Sole Plate
Rough Sill
Rough Sill
Rough Sill
Header
Double Plate

Story Pole Guide with the height of every horizontal part and length of every vertical part of the wall frame, made from 1 x 4 or 2 x 4.

II-4-A-AS

ASSIGNMENT SHEET

CARPENTRY

NAME______________________________ **DATE**________________________

UNIT: Wall Systems

TOPIC: Story Pole

ESSENTIAL ELEMENT(S): (a)(7)(A)
(a)(7)(C)
(e)(1)(E)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct bearing partitions, nonbearing partitions, and metal frames correctly.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will be able to use a story pole for measurements to construct a wall system correctly.

REFERENCES: II-4-A-IS
B.T. I-Unit III

DIRECTIONS: Read and answer the following questions in the space provided.

1. Who makes the story pole, and for what is it used?

2. What do the markings represent?

3. The markings are for what part of the wall frame?

4. Why is it better to use the story pole than the blueprints?

5. Why would a carpenter double-check the markings?

6. The story pole is useful in what type construction?

7. The story pole is a must for what type construction?

8. Using TM-5 and a ruler, sketch a story pole and label as shown.

II-4-A-JS-1

JOB SHEET

CARPENTRY

NAME______________________________ **DATE**_________________________

UNIT: Wall Systems

NAME OF JOB: Making a Story Pole

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(e)(1)(E)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct bearing partitions, nonbearing partitions, and metal frames correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to use a story pole for measurements to construct a wall system correctly.

TOOLS AND EQUIPMENT: Marking pencil, 25′ tape measure, speed square, blueprint wall section furnished by instructor

MATERIALS: straight 2" x 4" x 10′ board

GENERAL INSTRUCTIONS: Using wall section of blueprints, lay out the story pole using dimensions on plans. If plans are not available, use specifications provided by instructor.

PROCEDURES AND/OR TASKS:

1. Gather equipment and materials needed for task.
2. Use measurements provided to mark the pole.
3. If needed, use TM-5 for marking the pole.
4. After marking, have instructor check work.

STUDENT INFORMATION SHEET

CARPENTRY

UNIT: Wall Systems

TOPIC: Bearing Partition

ESSENTIAL ELEMENT(S): (a)(7)(A)
(a)(7)(C)
(e)(1)(E)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct bearing partitions, nonbearing partitions, and metal frames correctly.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to construct the bearing partition correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used when constructing wall systems will include reading concepts and skills, oral and written communications, and mathematics.*

PARTITIONS

After the outside walls are in place, the partitions are built and erected. At this stage, the roof can be enclosed to make it watertight. The bearing partitions that support the ceiling and roof are installed at this time. The nonbearing partitions can be completed later.

The roof trusses are supported entirely by the outside walls. The inside partitions are usually not finished until the roof is completed. The centerlines are taken from the plans and marked on the floor using the chalkline. Plates, headers, and studs are cut, laid out, assembled, and erected the same as the outside walls. The long partitions are completed first, then cross partitions, and then the short partitions which form wardrobes and closets.

Corners and intersections are completed as described for outside walls. Size and blocking can be reduced for nonbearing partitions. The main concern is providing a nailing surface at inside and outside corners for wallcover material.

ASSIGNMENT SHEET
CARPENTRY

NAME______________________________ **DATE**________________________

UNIT: Wall Systems

TOPIC: Bearing Partition

ESSENTIAL ELEMENT(S): (a)(7)(A)
(a)(7)(C)
(e)(1)(E)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct bearing partitions, nonbearing partitions, and metal frames correctly.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will be able to construct the bearing partition correctly.

REFERENCES: II-4-B-IS
B.T. I-Unit III

DIRECTIONS: Read and answer the following questions in the space provided.

1. What is erected as soon as the outside walls are completed?

2. The bearing partitions support what?

3. The roof trusses are supported entirely by what?

4. When are the inside partitions completed?

5. What is used to lay out centerlines for partitions?

6. What partitions are completed first?

7. Three 1" x 12" x 10′ boards contain how many board feet?

8. The carpenter has a 2" x 6" x 20′ board. How many 3 foot lengths can be cut from this piece of lumber?

9. How many 16 inch braces can be cut from a piece of lumber 340 inches long?

10. Figure the amount of time worked in 4 weeks by 12 carpenters who worked 30 hours each week.

II-4-B-JS-1

JOB SHEET

CARPENTRY

NAME________________________________ DATE__________________________

UNIT: Wall Systems

NAME OF JOB: Framing Bearing Partitions

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(1)(G)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct bearing partitions, nonbearing partitions, and metal frames correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to construct bearing partitions correctly.

TOOLS AND EQUIPMENT: Hammer, 25 ft. tape measure, chalkline, framing square, skill saw, speed square, power extension cord, nail apron, 2 foot level, carpenter's pencil, blueprint

MATERIALS: 2" x 4" x 16′ or 2" x 4" x 20′ utility framing lumber, 12d or 16d common nails

GENERAL INSTRUCTIONS: This activity can be used as a simulated work task in any building trades program. Student(s) can apply skills aquired in completing specified job task at a job site. Use blueprint provided by instructor to lay out exterior wall. Mark door and window openings as shown on blueprint. Use proper safety precautions.

PROCEDURES AND/OR TASKS:

1. Assemble tools, equipment, and material.

2. Assemble studs, trimmers, and any corner posts or partition "T"s needed.
3. Raise this section with the top plate. Toe nail the studs to the soleplate and temporarily nail braces in place to support the wall.
4. This process would be repeated until all exterior walls are in place.
5. Align and level each exterior wall. Use temporary braces on each side of corners from the top plate to the soleplate with 16 foot 2" x 4"s.
6. Complete window openings as shown on blueprints.
7. Install permanent bracing on exterior walls.
8. Have instructor check your work.
9. Replace tools and materials.
10. Clean work area.

STUDENT INFORMATION SHEET

CARPENTRY

UNIT: Wall Systems

TOPIC: Nonbearing Partitions

ESSENTIAL ELEMENT(S): (a)(7)(A)
(a)(7)(C)
(e)(1)(E)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct bearing partitions, nonbearing partitions, and metal frames correctly.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to construct a nonbearing partition correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used when constructing wall systems will include reading concepts and skills, oral and written communications, and mathematics.*

NONBEARING PARTITIONS

These partitions do not require headers and can be made with single pieces of 2" x 4" lumber. Carpenters may install trimmers around the openings to make them more rigid. They also provide additional framework for attaching casing and trim. The door openings in partitions are framed with a soleplate included at the bottom of the opening. When the walls are erected, the soleplate is cut out with a handsaw. The rough door openings are made 2 1/2 inches wider than the finished door size.

During wall and partition framing, many important details can be added. Openings for heat ducts, wall-mounted stools, and bathtubs can be cut in and framed at this time. Supports and holes made for vents and plumbing pipes can now be completed for plumbers to rough-in their jobs.

ASSIGNMENT SHEET

CARPENTRY

NAME______________________________ **DATE**________________________

UNIT: Wall Systems

TOPIC: Nonbearing Partitions

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(e)(1)(E)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct bearing partitions, nonbearing partitions, and metal frames correctly.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will be able to construct a nonbearing partition correctly.

REFERENCES:
II-4-C-IS
B.T. I-Unit III

DIRECTIONS: Read and answer the following questions in the space provided.

1. Why are nonbearing partitions not required to have headers?

2. What can be used to make partitions more rigid?

3. How is the soleplate removed after the wall is set?

4. The rough door opening is how much wider than a finished door size?

5. What is the purpose of nonbearing partitions?

JOB SHEET
CARPENTRY

NAME________________________________ **DATE**__________________________

UNIT:	Wall Systems
NAME OF JOB:	Frame a Stack Wall
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(1)(G)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct bearing partitions, nonbearing partitions, and metal frames correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to construct a nonbearing partition correctly.
TOOLS AND EQUIPMENT:	Chalkline, plumb bob, framing square, skill saw, speed square, extension cord, sawhorses, 4 foot level, carpenter's pencil, 3" hole saw
MATERIALS:	3" stack pipe, 2" x 4" x 16′ or 2" x 6" x 16′ lumber, 12d or 16d common nails
GENERAL INSTRUCTIONS:	This activity can be used as a simulated work task in any building trades program. Student(s) can apply skills aquired in completing specified job task at a job site. The stack wall houses the plumbing system and is designed to carry a 3" pipe. Most are constructed using 2" x 6" material. Use proper safety precautions.

PROCEDURES AND/OR TASKS:

1. Snap chalkline on subfloor to locate center lines and edges of the stack wall.

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2a. If stack extends above the subfloor, be sure it fits between the side chalk lines and/or the center chalk lines.

2b. If the stack stops below the subfloor, hang a plumb bob from the underside of the floor so it is in the center of the stack. Mark this point and drive a nail through the subfloor. This nail should lie on the center chalkline for the partition.

3. Lay out the top and bottom plates using the chalk lines and position the stack as guides to placement of studs.
4. Mark the center of the stack on the bottom and top plate. Cut or notch the bottom plate to fit around an existing pipe.
5. Raise, plumb, and attach the partition.
6. Using plumbing drawings or specifications, determine the size of vent pipe that will pass through the top plate.
7. Cut the top plate to allow the pipe to go through.
8. The cut can be reinforced with pieces of steel strapping, if needed.
9. Have instructor check your work.
10. Replace tools and materials.
11. Clean work area.

STUDENT INFORMATION SHEET

CARPENTRY

UNIT: Wall Systems

TOPIC: Metal Framing

ESSENTIAL ELEMENT(S): (a)(7)(A)
(a)(7)(C)
(e)(1)(E)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct bearing partitions, nonbearing partitions, and metal frames correctly.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to construct metal framing correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used when constructing wall systems will include reading concepts and skills, oral and written communications, and mathematics.*

INFORMATION

Metal framing sections, members, and accessories are factory-fabricated for easy assembly. These parts include studs, columns, beams, plates, joists, partition tees, corner posts, doors, and windows. This method of framing permits the use of splice-free lengths up to 40-feet for a continuous beam, truss, joist, or rafter.

The metal parts are put together with power screwdrivers using self-tapping screws. Wall sections can be assembled on the job or preassembled, and conventional sheathing can be attached to the framework with screws.

The studs are placed on 2′ centers to provide space for installing air conditioning and heating. The interior and exterior doors are prepainted and have hinges, locks, stops, and weather stripping if necessary.

The stud webs are prepunched for plumbing to be installed. The wiring is installed through insulated grommets that are installed in prepunched webs of the studs and plates. Wall and ceiling fixtures are attached to wood blocking spaced between the flanges of the wall trusses or studs.

The insulation is installed using the batts. These are placed between the studs on the exterior walls.

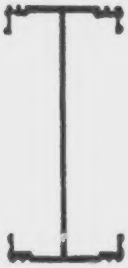
The roof trusses are set, and roof sheathing is attached in the same way as walls. Sheathing is installed with screws.

Some parts used in metal framing are shown in TM-6.

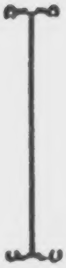
The floor assemblies are fastened to the foundation with studs or special type nails that are driven through the perimeter plate with a power-actuated stud driver; most are operated with a .22 caliber charge and will drive the special nail into concrete or metal.

A plywood floor would be installed with self-tapping screws and an adhesive.

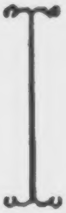
METAL FRAMING PARTS



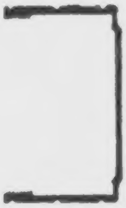
4 x 8 BEAM



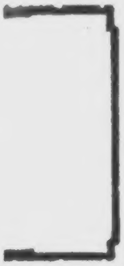
4 x 8 JOIST



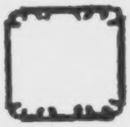
2 x 6
JOIST



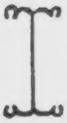
4 x 6 PLATE



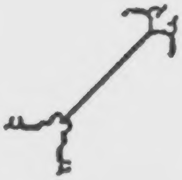
4 x 8 PLATE



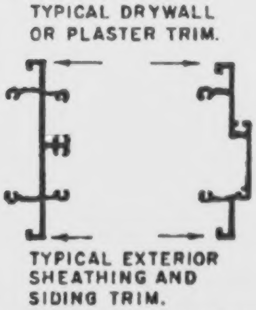
4 x 4
COLUMN



STUD

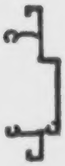


90° STUD
90°

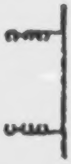

TYPICAL DRYWALL OR PLASTER TRIM.
TYPICAL EXTERIOR SHEATHING AND SIDING TRIM.

SLIDING
WINDOW
JAMB
STUD

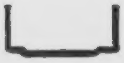
EXTERIOR
HINGED
DOOR JAMB
STUD



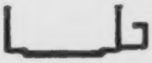
INTERIOR
HINGED
DOOR JAMB
STUD



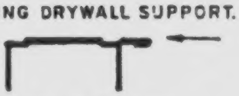
UNIVERSAL
TEE
STUD



PLATE



SINGLE BASEBOARD AND
PLATE


TYPICAL CEILING DRYWALL SUPPORT.

SINGLE FLANGED
PLATE

TM-6

ASSIGNMENT SHEET

CARPENTRY

NAME______________________________ DATE________________________

UNIT:	Wall Systems
TOPIC:	Metal Framing
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (e)(1)(E)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct bearing partitions, nonbearing partitions, and metal frames correctly.
SPECIFIC OBJECTIVE(S):	After completing this assignment sheet, the student(s) will be able to construct metal framing correctly.
REFERENCES:	II-4-D-IS
DIRECTIONS:	Read and answer the following questions in the space provided.

1. Why is metal framing prefabricated?

2. Why is metal framing sometimes completed up to 40′ lengths?

3. How are the metal parts put together?

4. What spacing is used for studs?

5. How is wiring installed in metal framing?

6. What type of insulation is used on metal exterior walls?

JOB SHEET

CARPENTRY

NAME________________________________ DATE____________________________

UNIT: Wall Systems

NAME OF JOB: Applying Metal Channel Molding and Fiber Siding

ESSENTIAL ELEMENT(S): (a)(7)(A)
(a)(7)(C)
(a)(7)(E)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct bearing partitions, nonbearing partitions, and metal frames correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to install metal channel molding and fiber siding correctly.

TOOLS AND EQUIPMENT: Hammer, 25 ft. steel tape, framing square, nails, sawhorses

MATERIALS: Metal channel molding, nails, mineral fiber siding, 12" x 24" units, blueprint or area furnished by instructor

GENERAL INSTRUCTIONS: This activity can be used as a simulated work task in any building trades program. Student(s) can apply skills aquired in completing specified job task at a job site. Use proper safety precautions.

PROCEDURES AND/OR TASKS:

1. Assemble tools, equipment, and material.
2. Snap a chalk line 11" up from the bottom of the cant strip.
3. Place a 1/4" x 1 1/2" cant strip at the base of the wall sheathing using 3/4" of the strip overhanging the foundation wall.

4. Secure the inside and outside corner units being installed.

5. Nail 1 5/8" metal channel molding to the cant strip.

6. The channel molding is a metal strip which helps to support the siding. (See figure 1.)

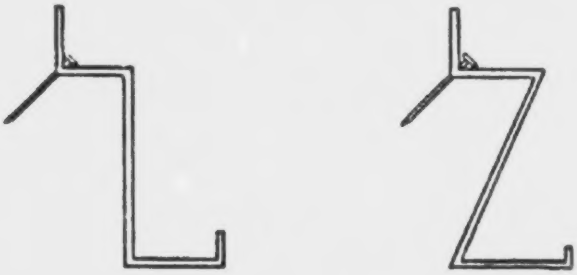


Figure 1 Metal Channel Molding

7. Place the single unit on the channel molding.

8. Place the channel molding unit on top of a shingle and nail the molding to the studs.

9. Drive the nails at an angle to assure a tight fit.

10. Start the course with a half unit and proceed to lay the remainder of the course with full units.

11. The remainder of the courses are installed using the same method.

12. Have instructor check work.

13. Replace tools, equipment, and materials.

14. Clean work area.

II-5-A-IS

STUDENT INFORMATION SHEET

CARPENTRY

UNIT: Door and Window Installation

TOPIC: Sliding Glass Doors

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(1)(G)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install sliding glass doors, pocket doors, and windows correctly.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to install sliding glass doors correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used when installing doors and windows will include mathematics, oral and written communications, and reading concepts.*

INFORMATION

Most of the French-type or casement-type doors are being replaced with sliding glass doors. These doors slide on stainless steel or nylon rollers. When equipped with insulated glass and weather stripping, heat loss and condensation are restricted to a satisfactory level--even in cold climates. Parts and installation details are similar to the sliding window units and can be bought as a factory-assembled frame and door unit.

The sliding door can be bought with several panels that slide. The panels labeled "L" or "R" refer to the direction they open. Sliding panels in doors must be glazed with a tempered safety glass. If the R.O. sizes are not on blueprints, carpenters should use the manufacturer's instructions for dimensions.

The sliding door is installed similar to the outside door. Before setting, a sealing compound should be laid across the opening to make a weathertight joint. The sill must be level and straight, especially when the door unit is heavy.

The jambs should be plumbed and wedges installed the same as for regular exterior door frames. After checking the frame, install by driving weatherproof nails through the side and head casting into the structure's frame parts.

After a sliding door has been installed, you should mark the glass panel or attach something to it to prevent someone from walking into it or hitting it.

The sliding glass doors, also called patio doors, may be made of metal or wood. The frames are made by manufacturers and are packaged with weatherstripping and hardware.

The frames for jambs are usually made of the same material as the doors. The sills of both type doors are made of heavy aluminum.

Frames are made to fit rough openings with 1/2-inch clearance at the head of jambs. Depending on the builder, a stone sill, wood, or a rowlock course of bricks should be in place before the doorframe is to be installed. Installation procedures usually are the same for all types of doors.

II-5-A-AS

ASSIGNMENT SHEET
CARPENTRY

NAME______________________________ **DATE**________________________

UNIT:	Door and Window Installation
TOPIC:	Sliding Glass Doors
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(1)(G)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install sliding glass doors, pocket doors, and windows correctly.
SPECIFIC OBJECTIVE(S):	After completing this assignment sheet, the student(s) will be able to install sliding glass doors correctly.
REFERENCES:	II-5-A-IS B.T. I-Unit III
DIRECTIONS:	Read and answer the following questions in the space provided.

1. What type doors are being replaced by the sliding door?

2. What is done to the glass panels to stop heat loss and condensation?

3. Sliding panels should be glazed with what?

4. What does the panel labeled "L" and "R" mean?

5. If R.O. is on the plans or sketches, what does it mean?

6. When installing the door, how would you weatherproof it?

7. What should be done when jambs are installed?

8. What should be done after the sliding door has been installed?

JOB SHEET

CARPENTRY

NAME______________________________ **DATE**____________________

UNIT: Door and Window Installation

NAME OF JOB: Installing the Sliding Door

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(1)(G)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install sliding glass doors, pocket doors, and windows correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to install sliding glass doors correctly.

TOOLS AND EQUIPMENT: Carpenter's level, screwdriver, hammer, caulk, and caulk gun

MATERIALS: Use materials per manufacturer's instructions.

GENERAL INSTRUCTIONS: Using blueprints, manufacturer's instructions, and directions from the instructor, install the sliding glass door.

PROCEDURES AND/OR TASKS:

1. Carefully read manufacturer's instructions to assemble the frame. Some procedures may vary.

2. Assemble the frame by nailing or screwing the head to the jambs and then caulk all the joints at sills and jambs.

3. Caulk the subfloor across the door opening, set the assembled frame on the caulking, and check that the sill is level. If needed, shim at sill and behind screw holes.

4. Check jambs for plumb, corners for square, and then recheck to see if the sill is level.

5. With the frame in position, attach at the sill with screws provided by manufacturer. Drive 1 1/2" wood screws through the shims.

6. Attach the head with screws. Be careful not to drive screws too far and bend head out of square.

7. Install the drip cap as required.

8. Fit the inner door in place by raising it to the top of the recess in the head and then lower it to the bottom track. The top screen track in some models has to be removed.

9. If needed, install closures at the head and sill and replace top screen track.

10. If the inner door is not fixed, make sure it slides easily and does not bend. If needed, adjust door height by turning the screws at the end or side of the bottom rail. These screws raise and lower the rollers.

11. Fit the outer door the same way as the inner door.

12. Check the door operation and adjust height if needed.

13. Install the handles and locking assemblies. These should be installed after height of rollers is adjusted.

14. Install the screen by setting bottom rollers on their track, and push down the top rollers until they snap onto the top track.

15. Have instructor check work.

STUDENT INFORMATION SHEET

CARPENTRY

UNIT: Door and Window Installation

TOPIC: Pocket Doors

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(l)(G)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install glass doors, pocket doors, and windows correctly .

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to install pocket doors correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used when installing doors and windows will include mathematics, oral and written communications, and reading concepts.*

DOOR INSTALLATION

The pocket-type sliding door slides into the wall and is installed often when doors are not closed often or space for door opening is needed for appliances or types of furniture. This door is convenient when there is a minimum clearance for a swinging door. TM-7 shows the pocket door and frame work.

The pocket door can be purchased with hardware, trim, and door as a unit. The standard widths are 2′ 0", 2′ 4", 2′ 6", 2′ 8", and 3′ 0", with the door thickness of 1 3/8" in different styles to match other doors in the house.

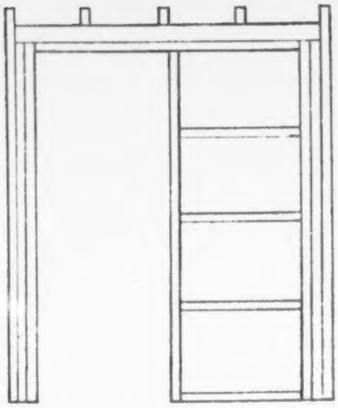
The rough opening is usually 6′ 11 1/2" to 7′ high and twice the door width plus 2" to 2 1/2". The header must be able to support any weight on the wall and the structure frame so there is no weight on the pocket. The pocket frame comes complete and ready to install into the rough wall opening; it can be installed with 8d finish nails through the wedges at the head and side jambs to plumb and level the unit. When the wallcovering has been applied, hang the door and install the stops. Care should be taken when wallcovering is applied. Use short nails. If nails are too long, they may scratch the door surface when it is slid into the pocket. You should also be careful when installing baseboards and molding.

FOLDING MULTIPANEL DOORS

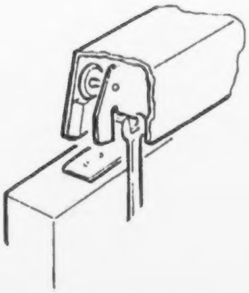
The multipanel door is made from narrow panels with a hinge on all the edges. The door is supported by nylon rollers and installed in an overhead metal track. The track is usually trimmed in the same type wood as the door. The track is installed in plaster or a wood frame. The panel surfaces are made from several materials and finishes. The best panels are genuine wood veneer bonded to a wood core. Particle board, that is wrapped in a woodgrain embossed vinyl film, is another type of panel surface.

The advantage of a folding door of this type is its space-saving feature. When the door is opened, the panels fold together forming a stack that does not require clear room space. The regular-type doors require room space to be opened and closed. There is only a small amount of space needed when the door is open. For an 8-ft. opening you would use only approximately 11 1/2 inches. If the entire opening needed to be used, the stack could fold back into a cavity built in the wall. These types of doors are available in a variety of sizes.

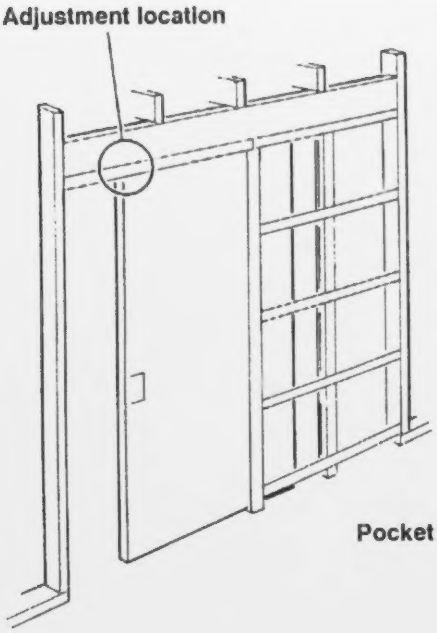
The folding doors can be used to divide rooms (laundry rooms). These types of doors can be used in many ways. The doors can be purchased with hardware, track, latches, and instructions from manufacturers to install the units.



Frame for pocket door



Track adjustment to level door



Adjustment location

Pocket door and frame

STUDENT ASSIGNMENT SHEET

CARPENTRY

NAME______________________________ **DATE**_________________________

UNIT: Door and Window Installation

TOPIC: Pocket Doors

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(1)(G)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install sliding glass doors, pocket doors, and windows correctly.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will install pocket doors correctly.

REFERENCES:
II-5-B-IS
B.T.I-Unit III

DIRECTIONS: Indicate if the statement is true or false by circling the **T** or **F**.

T F 1. Pocket-type doors slide into the wall.

T F 2. Pocket doors always have hardware on them.

T F 3. The door thickness is 2".

T F 4. The rough door opening is 6′ 11 1/2" or 7′ high.

T F 5. The header must support any weight on the wall.

T F 6. The pocket frame is installed with 10d finish nails.

T F 7. The door and stops are installed after wall covering is complete.

T F 8. Long nails can be used.

T F 9. Short nails should be used in baseboards and trim.

T F 10. If wall covering nails are too long, they will scratch the door.

JOB SHEET

CARPENTRY

NAME______________________________ **DATE**________________________

UNIT: Door and Window Installation

NAME OF JOB: Install Bifold Door

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(l)(G)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install sliding glass doors, pocket doors, and windows correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to install bifold doors correctly.

TOOLS AND EQUIPMENT: Screwdriver, folding rule, hammer, plumb bob, small wrench, level

MATERIALS: Hardware comes with bifold door unit.

GENERAL INSTRUCTIONS: Bifold doors are usually set 3/4" back from edge of the head casing. Bifold doors come in three heights (6′ 8", 7′ 6", and 8′ 0") and in 3′, 4′, 5′, or 6′ even widths. These units come in four- and two-door units. You should follow the manufacturer's instructions when installing these doors.

PROCEDURES AND/OR TASKS:

1. Assemble tools and materials needed.
2. Be sure opening of frame is square and then install doorcasing.

3. Connect the doors with the hinges if this was not done at the factory.
4. Mark the location of the overhead track and install it, leaving about 1/8" gap on each end of track.
5. Hang plumb bob on socket in track at top.
6. Mark location for sockets at bottom, near the door jambs.
7. Install the bottom sockets; they must line up with the top exactly.
8. Take one pair of doors and set the bottom pivot in the bottom socket.
9. Depress the top pivot and let it snap into place in the top socket.
10. Snap the rollers that support the outer edge of the door into the track.
11. Repeat steps 7, 8, 9, and 10 with the other pair of doors.
12. Check the doors for fit at the center and for horizontal and vertical alignment.
13. Adjust the bottom pivots to level; the doors should be 1/2" to 3/4" above the floor or carpet.
14. Mark closers on the inside of the doors where they meet.
15. Install closers loosely to check for fit, then tighten the screws.
16. Install the doorknobs.
17. Have instructor check work.

STUDENT INFORMATION SHEET

CARPENTRY

UNIT: Door and Window Installation

TOPIC: Window Installation

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(1)(G)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install sliding glass doors, pocket doors, and windows correctly.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to install windows correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used when installing doors and windows will include mathematics, oral and written communications, and reading concepts.*

WINDOW INSTALLATION

Window units are usually assembled by the manufacturer and are furnished with directions on how they are to be installed. The carpenter should follow these directions carefully.

Windows should be stored in a clean, dry area. They should be covered to keep dirt and dust off them. Windows should be checked for any damage that occurred while being shipped. Be sure to leave braces or spacer strips on windows until windows are installed. Most windows have 1/2" clearance on sides and 3/4" at top for leveling and plumbing. Building paper should be used around the rough opening when board sheathing is used to prevent air infiltration.

When installing the window unit, get sufficient help to set the window in the rough opening. If windows have been stored inside, they can be moved through the rough opening and then set in place. Secure the window in the opening temporarily.

The wedge blocks should be placed at each end and raised until in place and frame is level; for long windows, wedge blocks should be inserted in several places to keep the unit from sagging in the middle and to support the window.

Plumb the side jambs with a level and check the corners with a framing square. Nail the side jambs at the top side of casing first, then check window to see if it is square. Then, open the sash and see if the window operates smoothly.

Finally, nail the window in place with galvanized or aluminum nails spaced about 16" O.C. Be sure nails are long enough to penetrate the frame of the building.

Some carpenters will cover the inside of the windows with polyethylene film after installation to protect them while inside walls and ceilings are being completed.

SKYLIGHTS

Skylights can make a difference in a room's appearance and in the feeling of a room. Skylights add light and privacy in bathrooms, hallways, and attics. Skylights can be installed at a fraction of the expense of a regular window or building dormers in the roof, and can be installed in any type roof.

Many kitchens and dens have skylights installed for the natural light they give. They can be purchased as a fixed unit or as a ventilating unit that is hinged at the top and can be opened at the bottom for ventilation. The sash is hinged and can be operated from below with an extension pole.

The rough openings are completed in the same manner as for chimneys when building new units. When adding the skylight to an existing roof, measurements need to be taken, and the correct size window unit should be purchased.

The flashing flange is included with the frame structure. Be sure to follow instructions with each unit, as this will help to prevent leaks around the skylight when installed. The opening for the shaft of the skylight should be as tight as possible and should be insulated the same as ceilings. The shafts can be constructed in various ways according to the individual needs of the owner.

ASSIGNMENT SHEET

CARPENTRY

NAME________________________________ **DATE**__________________________

UNIT: Door and Window Installation

TOPIC: Window Installation

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(l)(G)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install sliding glass doors, pocket doors, and windows correctly.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will be able to install windows correctly.

REFERENCES:
III-5-C-IS
B.T.I-Unit III

DIRECTIONS: Read and answer the following questions in the space provided.

1. Who assembles window units?

2. How should windows be stored?

3. Why should windows be checked when received on a job?

4. Most windows have how much clearance at top and bottom?

5. Why should building paper be used around a rough opening with board sheathing?

6. What should you do before you set a window unit?

7. Why are wedge blocks used?

8. When you're installing a long window and you notice the sill has a sag, what do you do?

9. What is used to check the corners when installing windows?

10. What type of nails should be used when nailing the frame in place?

11. A blueprint calls for one wall to be done in 1′ x 4′ windows. If the wall is 108 inches long, how many windows can be installed with connecting mulls that are 13" wide?

II-5-C-JS-1

JOB SHEET

CARPENTRY

NAME______________________________ DATE__________________________

UNIT: Door and Window Installation

NAME OF JOB: Install Skylight

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(l)(G)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install sliding glass doors, pocket doors, and windows correctly.

SPECIFIC OBJECTIVE(S): After completion of this lesson, the student(s) will be able to install a skylight correctly.

TOOLS AND EQUIPMENT: Hammer, saw, roofing knife, metal shears, chalk, screwdrivers, and putty knife

MATERIALS: Materials packaged with skylight, roofing cement

GENERAL INSTRUCTIONS: Follow manufacturer's instructions. This type of skylight has no curb and is designed for a sloping roof. It has a horizontal flange on all sides and is installed directly on the roofing material.

PROCEDURES AND/OR TASKS:

1. Collect tools and materials needed to install the skylight.
2. Cut hole the size of the skylight opening per instructions.
3. Leave 4" of roofing paper over the opening on all sides.

4. Leave roofing material within 1/4 inch of opening at the lower edge.
5. Slit the roofing paper at corners on 45^{o} angle to the center of hole, then fold back over the shingles.
6. Set the skylight in position and mark outline with chalk on the roof.
7. Spread coat of roofing cement 1/8 inch thick inside the lines to within 1/2 inch of the opening.
8. Next, press the base of skylight firmly into place until roofing cement excess comes out around its perimeter.
9. Nail with roofing nails according to instructions.
10. Use putty knife to spread cement over edges and cover heads of all fasteners with the roofing cement.
11. Butt roofing shingles against the vault of the skylight.
12. Place roofing cement under roofing shingles around skylight and press down firmly into the cement.
13. Have instructor evaluate when complete.

JOB SHEET

CARPENTRY

NAME______________________________ **DATE**________________________

UNIT:	Door and Window Installation
NAME OF JOB:	Hanging a Window Unit
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(l)(G)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install sliding glass doors, pocket doors, and windows correctly.
SPECIFIC OBJECTIVE(S):	After completion of this lesson, the student(s) will be able to install a window unit correctly.
TOOLS AND EQUIPMENT:	Hammer, wood chisel, framing square, level, nails, 25 ft. tape measure
MATERIALS:	Complete window unit, material to shim sides, blueprint
GENERAL INSTRUCTIONS:	This activity can be used as a simulated work task in any building trades program. Student(s) can apply skills aquired in completing specified job task at a job site. Instructor furnishes print or practice wall to be used in task. Use proper safety precautions.

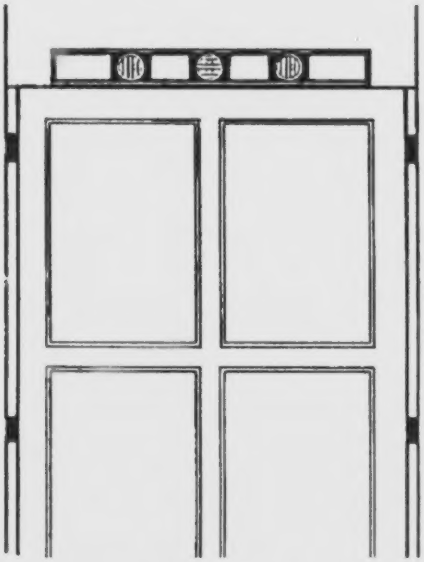
PROCEDURES AND/OR TASKS:

1. Trim any wall board or subcovering that extends into the rough opening for the window.

2. Check the rough opening and the window unit size.

3. There should be 1/2" clearance on the sides for leveling.

4. There should be 3/4" clearance at top for leveling.
5. Install the window frame in the rough opening on top of the subcovering.
6. Level the window in the opening.



7. Shim around the window frame to secure it in place.
8. Nail the frame in place.
9. Have instructor check work.
10. Replace tools and materials.
11. Clean work area.

STUDENT INFORMATION SHEET

CARPENTRY

UNIT: Interior Finish

TOPIC: Moisture-Resistant Wallboard

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(e)(l)(H)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install moisture-resistant wallboard, light fixtures, and floor coverings, and construct bookcases and room dividers correctly.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to install moisture-resistant wallboard correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used when applying interior finish will include oral and written communications, the application of reading concepts and skills, and the application of mathematical principles.*

INFORMATION

Gypsum wallboard is processed to withstand moisture and high humidity. For identification purposes, the facing paper is light green. The standard thicknesses are 1/2 inch and 5/8 inch. The width is 4 feet, and wallboard comes in lengths from 8 feet to 12 feet.

MOISTURE-RESISTANT WALLBOARD

This type wallboard is mostly used in bathrooms as a base for ceramic tiles or nonabsorbent finish materials for showers and tubs. The studs should be spaced on 16 inch O.C. if being installed in a bathroom with a tub. There should be a wood furring strip behind the tub so that when installed, the tub lip and wallboard will align. Be sure to keep at least a 1/4-inch space between wallboard and lip of tub. This can be done by laying a piece of 1/4-inch paneling between tub lip and wallboard when it is installed. (See Figure 1.)

When nailed, the piece of panel can be removed. The wallboard is installed the same as other wallboard. After nailing, apply a coat of tile adhesive over nail heads. Never apply a regular compound if tile is to be applied on the wallboard. When the wallboard has been installed, caulk cracks and edges before tile is installed.

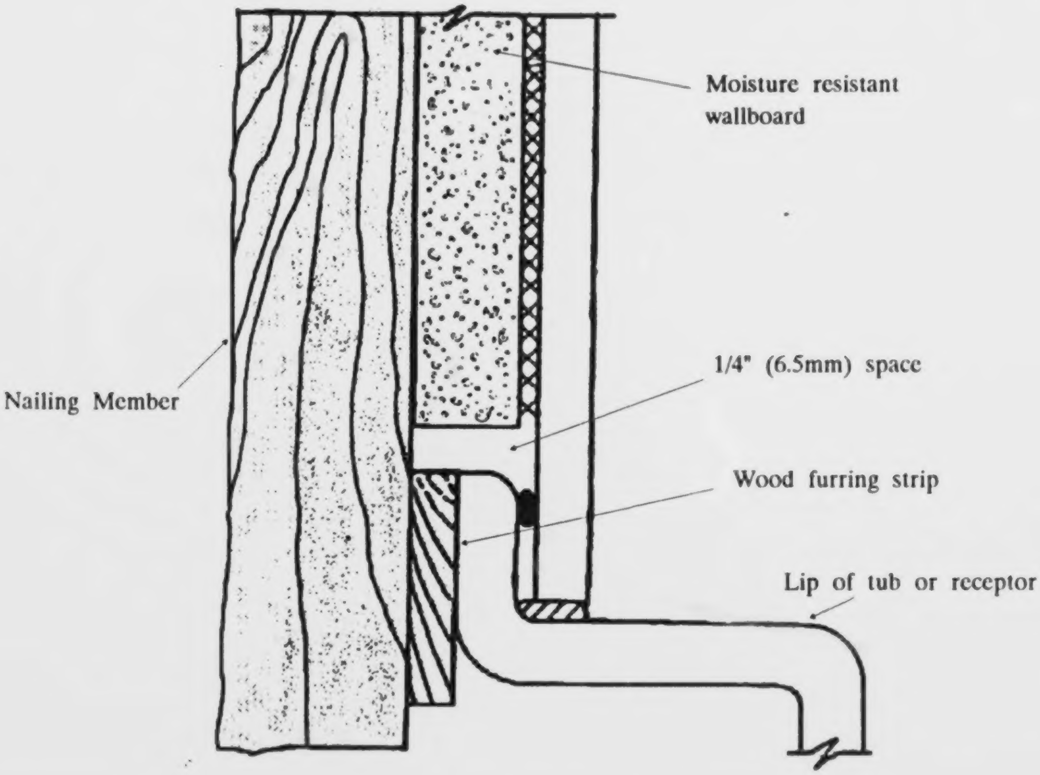

Moisture resistant wallboard
Nailing Member
1/4" (6.5mm) space
Wood furring strip
Lip of tub or receptor

Figure 1. Moisture-resistant wallboard is designed for shower and tub areas.

II-6-A-AS

ASSIGNMENT SHEET

CARPENTRY

NAME________________________________ **DATE**__________________________

UNIT: Interior Finish

TOPIC: Moisture-Resistant Wallboard

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(e)(1)(H)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install moisture-resistant wallboard, light fixtures, and floor coverings, and construct bookcases and room dividers correctly.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will be able to install moisture-resistant wallboard correctly.

REFERENCES:
II-6-A-IS
B.T.I-Unit III

DIRECTIONS: Indicate if the statement is **true** or **false** by circling the **T** or **F**.

T F 1. Gypsum wallboard is made to use in moist or high humidity areas.

T F 2. For identification, the facing paper is a light brown.

T F 3. Moisture-resistant wallboard is made in only 1/2" and 5/8" thicknesses.

T F 4. This type wallboard comes only in 8-inch lengths.

T F 5. The moisture-resistant wallboard comes in 2′ widths.

T F 6. Moisture-resistant wallboards are mostly used in bathrooms.

T F 7. Studs for wallboard should be on 14" O.C.

T F 8. There should be 1/4-inch space between wallboard and tub lip.

T F 9. Moisture-resistant wallboard is installed the same as other wallboards.

T F 10. The cracks and edges do not have to be caulked when installed.

JOB SHEET

CARPENTRY

NAME______________________________ DATE__________________________

UNIT:	Interior Finish
NAME OF JOB:	Installing Moisture-Resistant Wallboard
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(l)(H)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install moisture-resistant wallboard, light fixtures, and floor covering, and construct bookcases and room dividers correctly.
SPECIFIC OBJECTIVE(S):	After completion of this lesson, the student(s) will be able to install moisture-resistant wallboard correctly.
TOOLS AND EQUIPMENT:	Hammer, utility knife, handsaw, 25 ft. steel tape, 4 ft. level, 1/4" thick spacers, sawhorses
MATERIALS:	1 pint can of water-resistant wallboard sealer, brush, nails or screws, blueprint
GENERAL INSTRUCTIONS:	Moisture-resistant wallboard is frequently used in shower enclosures and bath tubs. The shower or bath tub must be in place before it can be installed. Any nicks or gouges have to be covered with sealant. Instructor should furnish blueprint to be used for dimensions and estimating material. Use proper safety precautions.

PROCEDURES AND/OR TASKS:

1. Check walls for alignment of framing to be covered.

2. Be sure blocking and piping are in place.
3. Measure the length of the wall along the long edge of the tub, and cut a piece of wallboard to this length.
4. Brush sealant on both ends of the piece.
5. Temporarily place a pair of 1/4" spacers along the edge of the tub or shower base.
6. Position one papered edge of the wallboard on the spacers, then attach the panel with nails or screws in standard spacing for wall application. If ceramic tiles are more than 5/16" thick, space nails 4" on center and screws 8" on center to hold the extra weight.
7. Cut end panels to length. If the tub is standard size and the wallboard is 10 feet long, both end panels and the side panel can be cut from a single sheet.
8. Cut holes for plumbing in end panels.
9. Apply sealant on both ends and at all holes.
10. Install the end panels.
11. Cut upper panels to length and width, then seal edges.
12. Install the upper panels with the cut edges toward the ceiling.
13. Remove spacers and fill around tub or shower with joint caulking.
14. If wallboard is to be papered or painted, finish the joints with joint treatment.
15. If the walls are to be tiled, brush sealant over heads of fasteners.
16. Have instructor check work.
17. Replace tools and materials.
18. Clean work area.

STUDENT INFORMATION SHEET

CARPENTRY

UNIT: Interior Finish

TOPIC: Bookcase

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(e)(l)(H)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install moisture-resistant wallboard, light fixtures, and floor coverings, and construct bookcases and room dividers correctly.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to construct a bookcase correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used when applying interior finish will include oral and written communications, the application of reading concepts and skills, and the application of mathematical principles.*

GENERAL INFORMATION

The bookcase, when made and attached to a wall in a permanent manner, is considered a built-in type of furniture. Bookcases are made for storage and for convenience.

Most bookcases are made with adjustable shelves in order to fit different-sized objects into the space needed. Some have fixed shelves that cannot be moved. Glass doors are installed on some bookcases in order to protect books and other valuable items from being torn or broken.

Bookcases are made from many different kinds of wood such as pine, mahogany, oak, pressed-wood panels, cherry, and pecan.

MANTELS

The mantels for fireplaces are often built in relation to bookshelves. The mantel over a fireplace is usually very decorative. Some mantels are desirable in homes of the traditional design. The mantel is usually made to fit the individual fireplace and can be constructed in a millwork shop to the specifications of the fireplace and the dimensions of what will be attached to it.

Mantels are usually preassembled and ready to be installed. Some carpenters are capable of building the mantels at the worksite, fitting the different effects to the owner's specifications. If the face of the fireplace is the same as the sidewalls, a mantel across the top would usually be installed. When the face of the walls extend out, there are usually panels made to cover each side.

ASSIGNMENT SHEET

CARPENTRY

NAME______________________________ **DATE**________________________

UNIT:	Interior Finish
TOPIC:	Bookcase
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (e)(l)(H)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install moisture-resistant wallboard, light fixtures, and floor coverings, and construct bookcases and room dividers correctly.
SPECIFIC OBJECTIVE(S):	After completing this assignment sheet, the student(s) will construct a bookcase correctly.
REFERENCES:	II-6-B-IS
DIRECTIONS:	Read and answer the questions in the space provided.

1. When is a bookcase considered a built-in?

2. What type shelves are used in most bookcases?

3. Why would glass doors be installed on a bookcase?

4. What is meant by the term "fixed shelves"?

5. List at least three different types of wood used for a bookcase.

6. Two 1" x 12" x 10′ boards contain how many board feet?

JOB SHEET

CARPENTRY

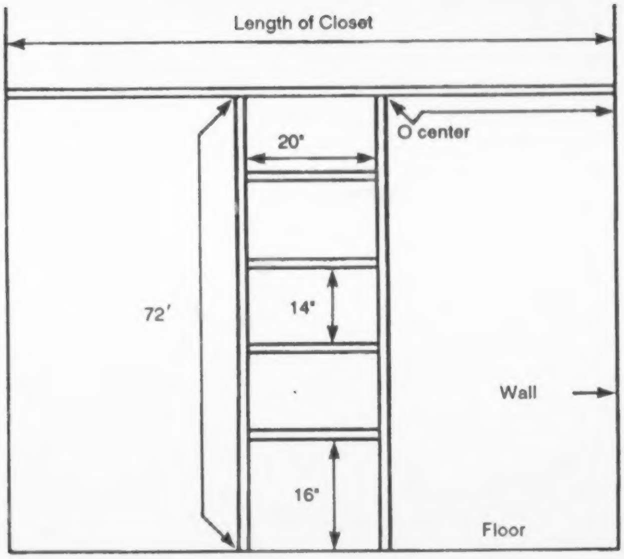
NAME_______________________________ **DATE**_________________________

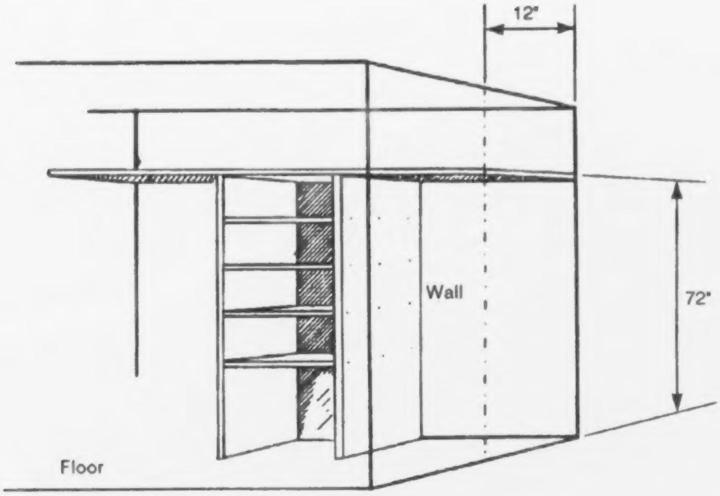
UNIT:	Interior Finish
NAME OF JOB:	Rod and Shelf Installation
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (e)(l)(H)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install moisture-resistant wallboard, light fixtures, and floor coverings, and construct bookcases and room dividers correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to execute rod and shelf installation correctly.
TOOLS AND EQUIPMENT:	Hammer, 1 lb. of 8d finish nails, saw, 25 ft. tape measure, speed square
MATERIALS:	1-1" x 12" x length of closet, 2-1" x 12" x 6′, 1-1" x 12" x 8′ shelves, 1" x 2" x length of closet, 2-1" x 2" x 12", 2-L brackets
GENERAL INSTRUCTIONS:	Adding rods and shelves to a closet will help organize clothes and shoes and make additional room to store clothes. This can be made from 1" x 12" and 1" x 2" for cleats.

PROCEDURES AND/OR TASKS:

1. Assemble tools and materials needed.
2. Measure length of closet—for top shelf, use 1" x 12".
3. Cut 2 1" x 12" x 6′ for sides.

4. Cut 4 1" x 12" x 20" for shelves.
5. Mark sides of shelf from the top.
6. First shelf will be 14" from top.
7. Second shelf will be 28" from top.
8. Third will be 32" from top.
9. Fourth will be 48" from top.
10. After sides are measured, stand on edge.
11. Set top shelf on center of mark. Using finish nails, nail sides and shelf together. (Repeat until all four shelves are nailed to sides.)
12. Take 1" x 2" board, cut 2-1" x 2" x 12" and nail one on each end of closet at 72".
13. Measure back of closet and cut 1" x 2" full length and nail to wall at 72". Then 1" x 12" for top shelf is ready to be cut and laid on top of 1" x 2"s.
14. Set shelves already made under top shelf and push against back wall.
15. Locate in center of closet and nail top shelf to the standing shelf.
16. Use 2-L brackets at bottom of standing shelf and attach to baseboard on wall.
17. Nail top shelf at each end.
18. When complete should look like sketch II-6-B-JS.
19. Have instructor check work.


Length of Closet
20"
O center
14"
72'
Wall
16"
Floor


12"
Wall
72"
Floor

STUDENT INFORMATION SHEET

CARPENTRY

UNIT: Interior Finish

TOPIC: Floor Covering

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(e)(l)(H)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install moisture-resistant wallboard, light fixtures, and floor coverings, and construct bookcases and room dividers correctly.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to install floor coverings correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used when applying interior finish will include oral and written communications, the application of reading concepts and skills, and the application of mathematical principles.*

INFORMATION

Carpet should always withstand foot traffic and resist wear. Carpet fibers should resist chemicals such as acids or alkalis, drinks, soaps, and foods.

Many things found in a home, such as grease, chocolate, eggs, tea, and coffee, will stain carpets. Carpets that are tightly woven hold dirt near the surface so they can be cleaned easily, while loosely-woven carpets tend to absorb dirt and hold it.

CARPET INSTALLER

Carpet installers work somewhat differently from resilient floor installers. The first thing to do is to measure the room. For a normal room, overall measurements are from end wall to end wall. Carpet installers should make a free-hand drawing of a room's layout as a guide. When the measurements of the room are known, the installer will estimate the amount of carpet needed--one square yard will equal nine square feet. The floor should always be clean and cracks filled with plastic wood or grout. The molding and baseboards and any nails or tacks should be removed.

LAYING CARPET

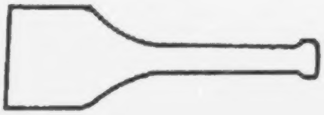
Laying carpet means stretching the carpet and hooking it on tack strips so that it is stretched and firmly hooked. There are two tools used to do this. The **knee kicker** is a tool with a heavy head and pins in the head that is attached to a knee rest. The pins in the head will go in the carpet and hold it while the carpet layer pushes with his knee to keep pressure on the carpet. The power stretcher is similar, but the head is pushed by a jack instead of the knee. One end is set against the wall and the other end extended to the carpet at the other wall. As the handle is pumped, the power stretcher will tighten the carpet, and it can then be attached to the tack strips along the floor next to the walls. You should attach each corner about one foot on each wall; then use the power stretcher and knee kicker to stretch and hook the carpet on tack stips around the room. The carpet is pushed into place around edges of the room with a small awl or putty knife.

When laying carpet around pipes or fixtures built into the floors, turn the carpet back and use chalk to mark the distance to the object. Use a carpet knife to cut the area marked for the pipe or fixtures and fold the flaps back after they are cut. When the carpet is laid around pipes, use face tape or back taping under the slit in the carpet to finish it off.

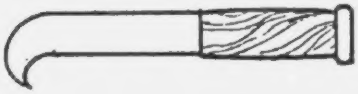
CARPET INSTALLATION TOOLS

Some of the tools used to lay carpet are:

Awl--A sharp-pointed object to force carpet in the space between the tack strip and the wallboard.

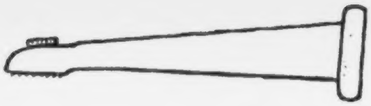


Carpet hook knife--Has a thin, curved, pointed-tipped steel blade used for cutting carpet.

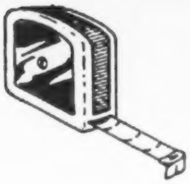


Hammers--The hammers used by carpet layers are tack hammers. Regular claw hammers are used by carpenters.

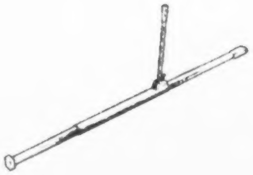
Knee kicker--This has a head with adjustable needles for gripping the carpet, and a padded extension for applying pressure with the knee or hand.



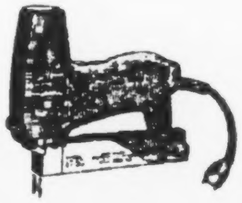
Measuring tape--25 foot steel tape or extension ruler is used to measure the room size to determine where carpet is laid.



Power stretcher--Is similar to the knee kicker head, but has a telescoping tubular arrangement connected to a lever to apply pressure to the carpet to stretch it.



Stapling guns--Several types of staple guns are: electric staple guns, stapling hammer (which staples when the head is struck), and others that staple when the handle is squeezed.



II-6-C-AS

ASSIGNMENT SHEET

CARPENTRY

NAME______________________________ **DATE**________________________

UNIT: Interior Finish

TOPIC: Floor Covering

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(e)(l)(H)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install moisture-resistant wallboard, light fixtures, and floor coverings, and construct bookcases and room dividers correctly.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will be able to install floor covering correctly.

REFERENCES:
II-6-C-IS
B.T.I-Unit III

DIRECTIONS: Read and answer the following questions in the space provided.

1. What two things should you check on when carpet is considered?

2. What is the first thing a carpet layer should do?

3. How should the floor be prepared before laying carpet?

4. Describe a knee kicker.

5. Describe a power stretcher.

6. What does laying the carpet mean?

7. What are tack strips used for?

8. What is used to push carpet under the wallboard?

9. What is done when carpet is laid around a pipe?

10. What is a carpet hook knife?

JOB SHEET

CARPENTRY

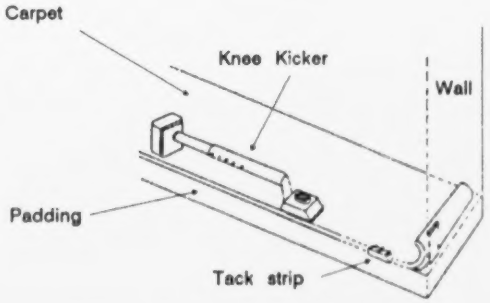
NAME______________________________ **DATE**__________________________

UNIT:	Interior Finish
NAME OF JOB:	Install Floor Covering
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(1)(H)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install moisture-resistant wallboard, light fixtures, and floor coverings, and construct bookcases and room dividers correctly.
SPECIFIC OBJECTIVE(S):	After completion of this lesson, the student(s) will be able to install floor covering correctly.
TOOLS AND EQUIPMENT:	Hammer, carpet hook knife, 25 ft. steel tape, knee kicker, awls, chalkline, staple gun, power stretcher
MATERIALS:	Carpet, padding, tack strip
GENERAL INSTRUCTIONS:	This activity can be used as a simulated work task in any building trades program. Student(s) can apply skills aquired in completing specified job task at a job site. Size of room to be furnished by instructor. Student(s) will also estimate amount of material needed and quote price from carpet dealer. Use proper safety precautions.

PROCEDURES AND/OR TASKS:

1. Make sketch of room, and mark door openings for a guide.
2. Measure all dimensions of floor area.

3. Once the measurements are complete, the carpet installer will estimate the amount of carpet needed.
4. Divide the room into its shapes: rectangle, triangle, circle.
5. Add these areas together to get the total area of the room.
6. Use these formulas to get the area for the more common formats:
   Area of rectangle = length x width
   Area of triangle = 1/2 x length x width
   Area of circle = 3.1416 x R^2
   One square yard = 9 square feet
7. List size of material needed.
8. Check with carpet dealer on price of material and list.
9. Clean floor to lay carpet and padding.
10. Install tack strip around room.
11. Lay padding: padding can be stapled, tacked, or glued to the floor.
12. Lay carpet on top of padding and roll out.
13. Tools to stretch carpet are the knee kicker and the power stretcher.
14. Place one edge of carpet over the tack strip up to one of the end walls by 3/8" with a small awl.
15. Hook carpet on tack strip in corners for about 1 foot along one corner of each wall.
16. Use knee kicker and power stretcher to sketch and hook carpet all along one of the walls.



17. Go to the opposite wall, and stretch and hook carpet on tack strip.
18. Once carpet is in place, the carpet is forced into the gully between the tack strip and wall by pushing it down with a small awl or putty knife.
19. Have instructor check work.
20. Replace tools and materials.
21. Clean work area.

STUDENT INFORMATION SHEET

CARPENTRY

UNIT:	Interior Finish
TOPIC:	Room Dividers
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (e)(l)(H)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install moisture-resistant wallboard, light fixtures, and floor coverings, and construct bookcases and room dividers correctly.
SPECIFIC OBJECTIVE(S):	After completing this information sheet, the student(s) will be able to construct room dividers correctly.
BASIC ACADEMIC SKILLS APPLICATION:	*Basic academic skills used when applying interior finish will include oral and written communications, the application of reading concepts and skills, and the application of mathematical principles.*

INFORMATION

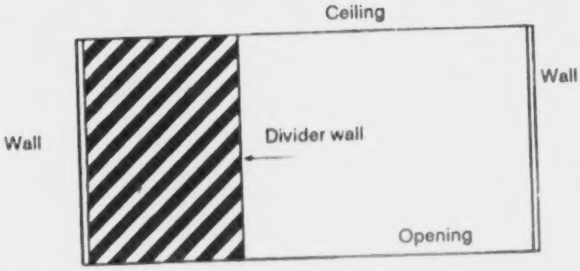
Room dividers are used to separate rooms into two or more parts. Room dividers can be used to separate living rooms and dining rooms, and can be used to separate a bedroom for two children to have privacy. The divider can also be used to make a hallway at an entrance. There are two types of dividers. One type of divider extends from the floor to ceiling. Another type of divider has openings in it or can be half open.

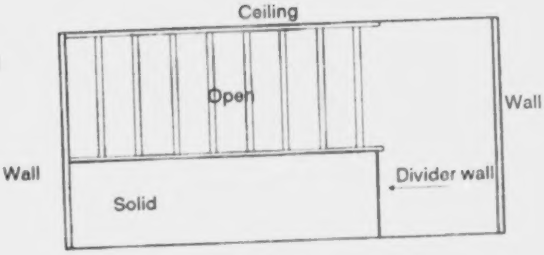
The dividers can be built on the job or may be obtained assembled from contractors.

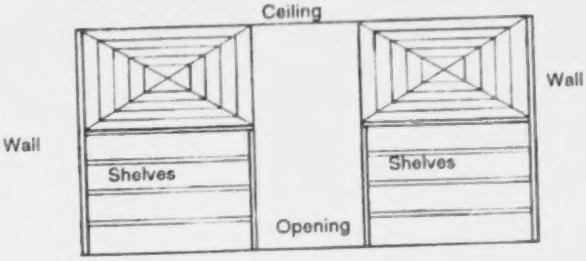
TYPES OF ROOM DIVIDERS

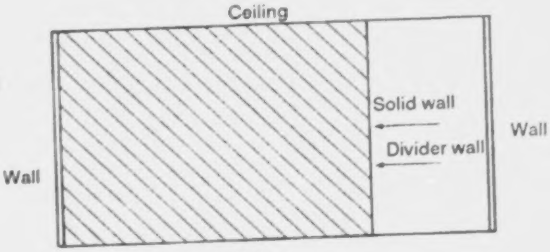
Some types of room dividers are shown on TM-8

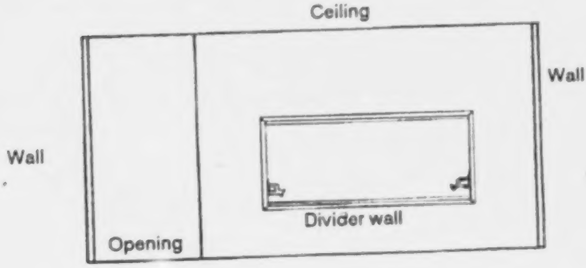
Room-divider walls can be used on patios, in garages, or wherever you may want to separate one area from the other. When used on patios, 4′ x 8′ sheets of lattice panels are good dividers. Ivy or other types of ground cover can grow on the panels and make the area more private.

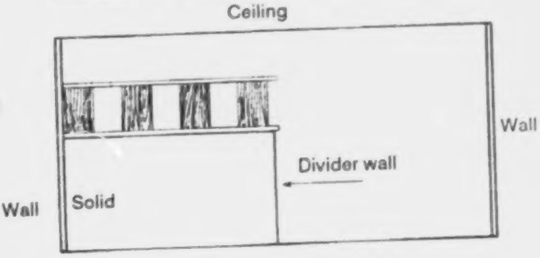

Ceiling
Wall
Wall
Divider wall
Opening


Ceiling
Open
Wall
Wall
Divider wall
Solid


Ceiling
Wall
Wall
Shelves
Shelves
Opening


Ceiling
Solid wall
Divider wall
Wall
Wall


Ceiling
Wall
Wall
Divider wall
Opening


Ceiling
Wall
Divider wall
Wall
Solid

II-6-D-AS

ASSIGNMENT SHEET

CARPENTRY

NAME________________________________ **DATE**__________________________

UNIT: Interior Finish

TOPIC Room Dividers

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(e)(1)(H)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install moisture-resistant wallboard, light fixtures, and floor coverings, and construct bookcases and room dividers correctly.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will be able to construct room dividers correctly.

REFERENCES: II-6-D-IS

DIRECTIONS: Read and answer the following questions by circling the **T** for **true** or **F** for **false**.

T F 1. Divider walls are used in all houses.

T F 2. Divider walls are made of metal.

T F 3. The divider wall is used to separate a room into two or more parts.

T F 4. Divider walls can be used to separate a bedroom for two or more children.

T F 5. All divider walls are solid.

T F 6. Divider walls can be purchased assembled.

T F 7. There is more than one type of divider wall.

T F 8. Divider walls can be various sizes.

T F 9. Some divider walls have openings.

T F 10. All divider walls go from floor to ceiling.

JOB SHEET

CARPENTRY

NAME________________________________ **DATE**__________________________

UNIT: Interior Finish

NAME OF JOB: Building A Divider Wall

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(e)(1)(H)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install moisture-resistant wallboard, light fixtures, and floor coverings, and construct bookcases and room dividers correctly.

SPECIFIC OBJECTIVE(S): After completion of this lesson, the student(s) will be able to construct room dividers correctly.

TOOLS AND EQUIPMENT: Power saw, hammer, jig saw, 25 ft. tape measure, square, chalkline

MATERIALS:
1-2" x 4" x 8′
1-2" x 10" x 9′
5-2" x 4" x 46 1/4"
1-1" corner mold 8′
5-1/2 basemold
2-sheets paneling
1-sheet lattice panel
1/4 lb. No. 4 finishing nails
1 lb. 10d common nails
sawhorses

GENERAL INSTRUCTIONS: The base of the divider wall can be preassembled or precut and assembled in the room where it is to be installed. The divider wall can be used in any room by shortening or lengthening measurements. Some different types are shown on TM-8. Use two or more students as needed on project. Use sketch to make and install divider wall. Materials relate to sketch for II-6-D-JS-1.

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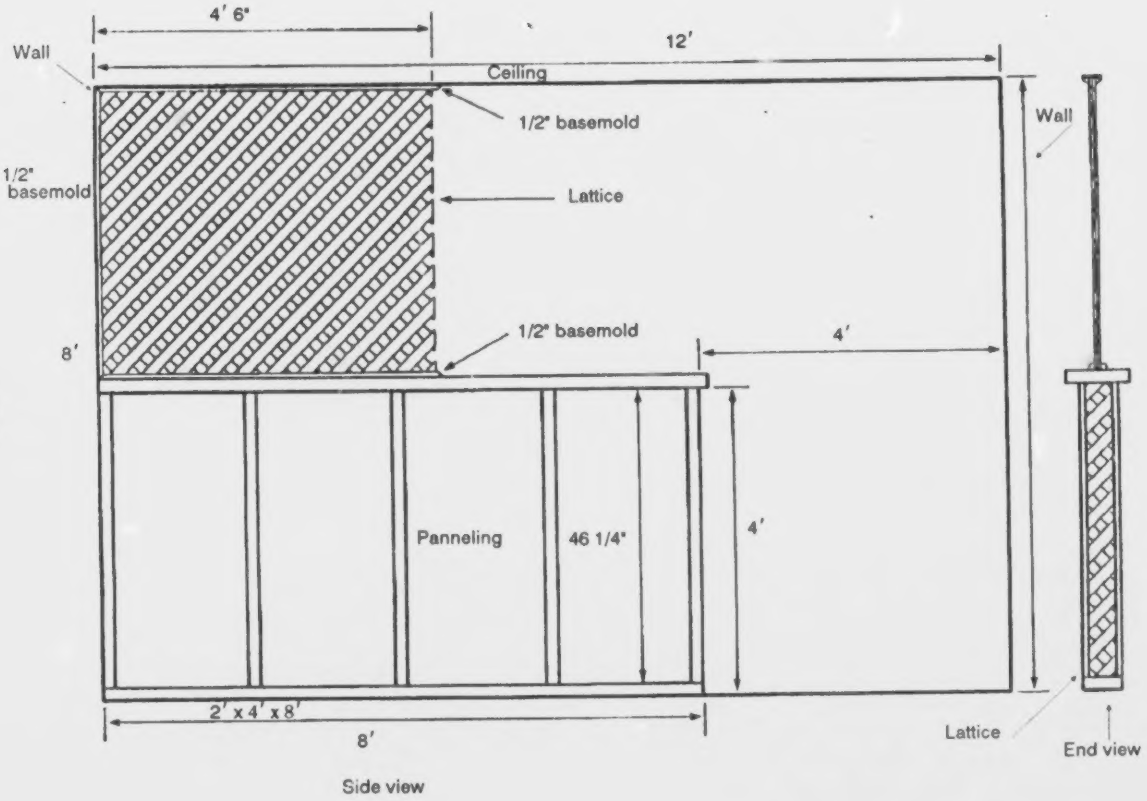
PROCEDURES AND/OR TASKS:

1. Assemble tools and materials, and use sketch provided.
2. Using power saw, cut 5 pieces of 2" x 4" x 46 1/4".
3. Cut 2" x 10" x 9': square both ends, then cut to 8' 1".
4. Using the jig saw, cut 6" off the end of the lattice panel; the 6" piece will be used on the end of the wall.
5. Locate where wall is to be installed, measure with tape, and mark floor with chalkline.
6. Locate wall where the divider will be installed and mark. Be sure divider will sit straight. If at all possible, line up with a wall stud for support.
7. Assemble frame and set in place; nail the bottom plate and wall securely. Be sure it is secure.
8. If installed on concrete slab, be sure to use concrete nails.
9. After frame is in place, measure center of the 2" x 10" top, and mark a line from wall 46" out on center of the board.
10. Measure the width of the lattice panel. Take the 6" piece and set it lengthwise on the line and butt it to the wall.
11. Cut one 46" piece of the 1/2 basemold. While holding the piece of lattice on line, lay the basemold against the edge of the panel with flat side against panel and flat on the bottom.
12. Use finish nails to nail it in place.
13. Repeat steps 11 and 12 to install pieces on wall and ceiling; measure to be sure molding is in line.
14. The lattice sheet will have to be cut to 46 1/4" x 4' 6"; then set in place.
15. Repeat steps 11, 12, and 13 to install molding using finishing nails.
16. Use 6" piece of lattice on end of wall, cut to fit end of wall, and nail with finish nails.
17. Install paneling on both sides of frame using paneling nails.
18. Cut and install outside corner molding on end of wall.
19. Cut inside corner mold and fit from floor to bottom of 2" x 10".
20. Have supervisor check project.

DIVIDER WALL


4′ 6"
12′
Wall
Ceiling
1/2" basemold
1/2" basemold
Lattice
1/2" basemold
8′
4′
Wall
Panneling
46 1/4"
4′
2′ x 4′ x 8′
8′
Side view
Lattice
End view

549

STUDENT INFORMATION SHEET

CARPENTRY

UNIT:	Interior Finish
TOPIC:	Lighting
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (e)(l)(H)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install moisture-resistant wallboard, light fixtures, and floor coverings, and construct bookcases and room dividers correctly.
SPECIFIC OBJECTIVE(S):	After completing this information sheet, the student(s) will install lighting fixtures correctly.
BASIC ACADEMIC SKILLS APPLICATION:	*Basic academic skills used when applying interior finish will include oral and written communications, the application of reading concepts and skills, and the application of mathematical principles.*

TYPES OF LIGHTING

Many things can be accomplished without having to rewire or make structure changes. Replacing a switch with a dimmer only takes a few minutes and allows you to create mood lighting effects very easily. Using the dimmer allows you to use less lighting at times and saves energy. The dimmer can also be used with ceiling fans. Before working on any electrical fixtures, outlets, or switches, be sure to turn off electrical branches by tripping the breakers or remove the fuses.

TRACK LIGHTING

Track lighting is the best way to get extra lighting in inconvenient places without tearing into walls or the ceiling. The tracks can be mounted on walls and ceilings, and the lights can be clamped on and placed where they are needed. This system is very useful when certain areas, pieces of furniture, or pictures need more direct lighting.

FLUORESCENT LIGHTING

For the same number of watts as filament lighting, these lamps give five or more times the lighting, and last about 7,500 hours.

The fluorescent lamp sizes range from miniature to the long, commercial variety, and all are very efficient. The color of light produced is called "warm white."

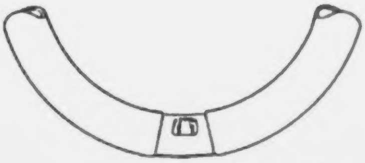
Most tubes can be disguised with a baffle, or by use of translucent covers for use in kitchens and other areas.

Some of the smallest lamps use only 9 watts, but give the light of a 40-watt GLS bulb. The 18-watt lamp gives the same lighting as a 75-watt bulb. These lamps fit in the conventional holder. These type lamps are more expensive, but will last in excess of 5,000 hours and cost less to operate.

TYPES OF LAMPS

FLUORESCENT

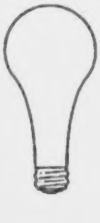
Pin type



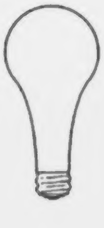
Conventional base circular

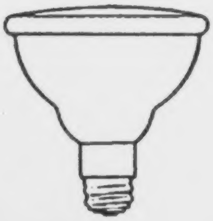
STANDARD LAMP

R-Indoor

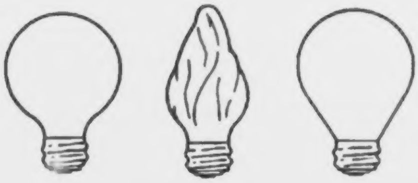


A-Lamp





PAR-Exterior Use



Decorative

ASSIGNMENT SHEET

CARPENTRY

NAME ______________________________ DATE __________________

UNIT:	Interior Finish
TOPIC:	Lighting
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (e)(l)(H)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install moisture-resistant wallboard, light fixtures, and floor coverings, and construct bookcases and room dividers correctly.
SPECIFIC OBJECTIVE(S):	After completing this assignment sheet, the student(s) will be able to install lighting fixtures correctly.
REFERENCES:	II-6-E-IS
DIRECTIONS:	Read and answer the following questions in the space provided.

1. Before doing electrical work, __________________ should be disconnected.

   A. light switch
   B. breaker panel
   C. fixtures
   D. all of the above

2. A __________________ type switch will allow you to create mood lighting.

   A. single pole
   B. three-way
   C. dimmer
   D. combination

3. The best way to install extra lighting is to use the ______________ system.

   A. rewire
   B. tracking
   C. switch
   D. none of the above

4. The tracks can be used in ______________ area(s).

A. corner
B. ceiling
C. any
D. wall

5. The ______________ is the most economical lamp.

A. GLS bulb
B. fluorescent
C. standard
D. none of the above

6. Fluorescent lamps last about ____________ hours.

A. 6,000
B. 5,000
C. 7,000
D. 7,500

7. The color produced by fluorescent lamps is called ______________.

A. soft white
B. warm white
C. bright white
D. none of the above

8. A (n)______________- watt fluorescent lamp is the same as a 40-watt bulb.

A. 18
B. 12
C. 20
D. 9

9. A 75-watt bulb would give the same amount of light as a(n) ______________-watt fluorescent lamp.

A. 10
B. 18
C. 40
D. 60

10. The small fluorescent lamps will last in excess of ______________ hours.

A. 3,000
B. 4,500
C. 5,000
D. 7,500

JOB SHEET

CARPENTRY

NAME______________________________ **DATE**__________________________

UNIT:	Interior Finish
NAME OF JOB:	Installing a Dimmer Switch
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (e)(l)(H)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install moisture-resistant wallboard, light fixtures, and floor coverings, and construct bookcases and room dividers correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to install a dimmer switch correctly.
TOOLS AND EQUIPMENT:	Wire cutters, knife, thin-bladed screwdriver, flashlight
MATERIALS:	Single-pole dimmer switch, wire caps (if switch comes with wires)
GENERAL INSTRUCTIONS:	Dimmer switches are installed the same way as the single-pole throw switches.

PROCEDURES AND/OR TASKS:

1. Assemble tools and materials needed.

2. Turn power off at breaker panel.

3. Use flashlight if needed.

4. Remove switch cover.

5. Use screwdriver to remove screws holding switch.

6. Loosen screws on each side of switch and remove wires from around screws.

7. Take dimmer and install the wires, one on each side, and tighten screws.

8. Put dimmer in electrical box and tighten screws to hold in place.

9. Install cover plate.

10. Turn electricity on at panel box.

11. Check operation of dimmer.

12. Have instructor evaluate.

STUDENT INFORMATION SHEET

CARPENTRY

UNIT: Exterior Finish

TOPIC: Exterior Finishes

ESSENTIAL ELEMENT(S): (a)(7)(A)
(a)(7)(C)
(e)(l)(H)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install exterior finishing correctly.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to identify and state the purpose and use of exterior finishes correctly.

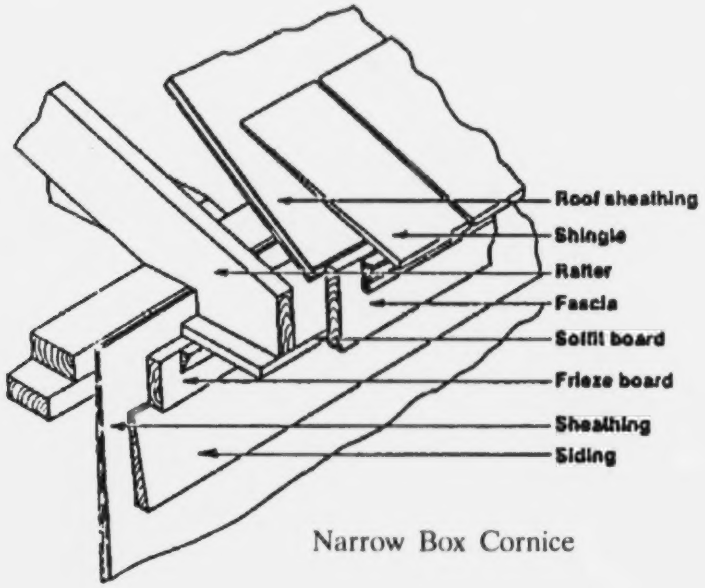
BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used when applying exterior wall finish will include mathematics and oral and written communications.*

THE EXTERIOR FINISH

All exterior materials of a structure are included when the term "exterior finish" is used. It usually refers to wall coverings, roofing materials, cornice trim boards, and trim used for windows and doors. This also covers special design woodwork for entrances.

CORNICES

The cornice is made by the roof overhang and provides a finished connection between the edge of the roof and the wall. The architect will determine the design requirements and details for cornice construction.



Narrow Box Cornice

SOFFITS

The soffit used with cornice work is the underside of the members of the building, beams, and arches. The soffit covers the beams and rafters for a smooth, finished appearance.

The nailing strip is attached to the fascia between rafters. Nailing strips, ledges, and lookouts provide a frame for the soffit, or plancier, to be applied.

WOOD SHINGLES

The wood shingles are sometimes used for wallcovering. Wood shingles are very durable and are applied in various ways. Most shingles are made in various widths from 3" to 14".

VERTICAL SIDING

Vertical siding often is used to set off gabel ends or entrances. The plain-surfaced matched boards, pattern-matched boards, and square-edge boards are covered with batten strips.

STUCCO

When applied properly, stucco makes a nice exterior wall finish. When stucco is used on a building more then one story high, balloon framing for the outside walls should be used.

ASSIGNMENT SHEET

CARPENTRY

NAME______________________________ **DATE**________________________

UNIT: Exterior Finish

TOPIC: Exterior Finishes

ESSENTIAL ELEMENT(S): (a)(7)(A)
(a)(7)(C)
(e)(l)(H)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install exterior finishes correctly.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will be able to identify and state the purpose and use of exterior finishes correctly.

REFERENCES: II-7-A-IS
B.T.I-Unit III

DIRECTIONS: Read and answer the following statements. Indicate true or false by circling the **T** or the **F**.

T F 1. All exterior materials are covered when the term "exterior finish" is used.

T F 2. Exterior finish covers just siding.

T F 3. The exterior finish does not include special woodwork design.

T F 4. The cornice is made by the roof overhang.

T F 5. The carpenter determines details for cornice construction.

T F 6. Details and design are determined by an architect.

T F 7. The soffit covers the underside of the cornice.

T F 8. Wood shingles are used only on the roof.

T F 9. Wood shingles are just one size

T F 10. Stucco makes a good exterior wall finish.

11. A contractor ordered 12 bundles of shingles. Each bundle contained 250 shingles. How many shingles were in the total order?

12. A contractor spent $141.72 for shingles, $16.81 for felt paper, and $6.27 for flashing. What is the total cost of the roofing materials?

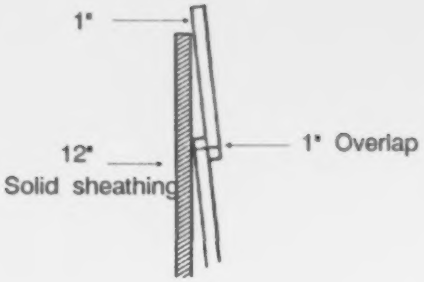
JOB SHEET
CARPENTRY

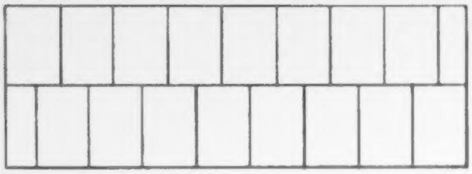
NAME______________________________ **DATE**________________________

UNIT:	Exterior Finish
NAME OF JOB:	Wall Covering-Wood Shingle Panels
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(l)(H)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install exterior finishes correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to construct wood shingle panels correctly.
TOOLS AND EQUIPMENT:	Hammer, skill saw, sawhorses, 25 ft. steel tape, framing square, chalkline
MATERIALS:	1 bundle of 16" wood shingles, nails, building paper, wood sheathing, 1 sheet 1/2" plywood, sealer to fireproof, brush
GENERAL INSTRUCTIONS:	This activity can be used as a simulated work task in any building trades program. Student(s) can apply skills aquired in completing specified job task at a job site. Task is for single coursing. Measure and estimate material for 12" x 8′ panel. Use proper safety precautions.

PROCEDURES AND/OR TASKS:

1. Establish the exposure for the individual course.
2. Lay out a sheet of plywood on sawhorses; cut into 12" x 8′ pieces.




Finished Panel

3. Leave 1" as shown for panel overlap.
4. Panels can be made with either regular shingles and stained, or with cedar shingles.
5. Use sealer on shingles, coating both sides with brush.
6. Have instructor check work.
7. Replace tools and materials.
8. Clean work area.

II-7-A-JS-2

JOB SHEET

CARPENTRY

NAME______________________________ **DATE**________________________

UNIT: Exterior Finish

NAME OF JOB: Construct an Open Cornice

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(l)(H)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install exterior finishes correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to construct an open cornice correctly.

TOOLS AND EQUIPMENT: Hammer, 25 ft. tape measure, framing square, skill saw, handsaw, nails, chalkline, speed square, sawhorses

MATERIALS: 2" x 6" material as required, 1/2" quarter round molding, furring strip, shingle molding or drip edge, blueprint furnished by instructor, fascia board

GENERAL INSTRUCTIONS: This activity can be used as a simulated work task in any building trades program. Student(s) can apply skills aquired in completing specified job task at a job site. Use proper safety precautions.

PROCEDURES AND/OR TASKS:

1. Assemble tools, equipment, and material.
2. Cut and secure wind blocks between rafters using 2" x 6".

3. Snap a chalk line the length of the wall for the location of the bottom of the frieze board.
4. The frieze board should extend 1/2" below the bottom of the rafter tails.
5. Cut and secure furring strip to the wind blocks.
6. The furring strip should be as thick as the sheathing and the wide frieze.
7. Nail the frieze board between the rafters and against the furring strip.
8. Be sure the boards are wide enough to extend from the top of the rafter to 1 inch below the bottom of the rafter tail.
9. Nail and fit the cove molding against the bottom edge of the frieze.
10. Fit and nail quarter round molding flush with the tops of the rafters.
11. Nail the fascia to the end of the rafter tails.
12. The fascia should extend 1/2" below the rafter tail.
13. The shingle molding or drip edge should be nailed to the fascia.
14. Have instructor check work.
15. Replace tools, equipment, and materials.
16. Clean work area.

STUDENT INFORMATION SHEET

CARPENTRY

UNIT: Exterior Finish

TOPIC: Vertical Siding

ESSENTIAL ELEMENT(S): (a)(7)(A)
(a)(7)(C)
(e)(l)(H)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install exterior finishes correctly.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to install vertical siding correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used when applying exterior wall finish will include mathematics and oral and written communications.*

VERTICAL SIDING

Vertical siding is used mostly for main walls. Vertical siding should be no more than 8 inches wide when made from solid lumber, and should be installed with 8d nails no more than 4 feet apart. Backer blocks are installed horizontally between studs to provide a nailing base. Boards are undercut on the bottom for water drip.

When the batten is installed over the cracks between boards, it is fastened at the bearing points with 10d nails. Locate the nails in the center of the batten so the shank will pass between the boards and into the bearing.

The vertical sheets of plywood or composition material are used to make a board-and-batten effect. Simply install a vertical strip over the crack and space the vertical strips over the joints at several positions as you install the wall covering.

The vertical siding is used to set off gabel ends and entrance ways. The vertical siding could be plain-surfaced matched boards, matched-pattern boards, or squared-edged boards with batten strips covering the joints.

Battens used over rough boards have a rustic appearance and set off the siding. Battens also provide space for contraction and expansion of the siding.

II-7-B-AS

ASSIGNMENT SHEET

CARPENTRY

NAME______________________________ **DATE**________________________

UNIT: Exterior Finish

TOPIC: Vertical Siding

ESSENTIAL ELEMENT(S): (a)(7)(A)
(a)(7)(C)
(e)(l)(H)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install exterior finishes correctly.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will be able to install vertical siding correctly.

REFERENCES: II-7-B-IS
B.T.I-Unit III

DIRECTIONS: Read each of the following statements. Indicate true or false by circling the **T** or the **F**.

T F 1. Vertical siding is used only on main walls.

T F 2. The vertical siding should be only 8 inches wide when using solid lumber.

T F 3. You should use 8d nails, no more than 4 ft. apart.

T F 4. Backer block is used for a nailing base.

T F 5. The batten is installed with 12d nails.

T F 6. The batten should be nailed in the center with 10d nails.

T F 7. Boards are undercut for water drip.

T F 8. Plywood sheets can be made to have a board-and-batten look.

T F 9. Plywood batten is just placed on cracks

T F 10. Backer boards are installed vertically.

11. A 4′ x 8′ sheet of plywood is 32 square feet. How many sheets would be needed to side 2,176 square feet of wall space?

JOB SHEET

CARPENTRY

NAME______________________________ **DATE**________________________

UNIT: Exterior Finish

NAME OF JOB: Apply Siding

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(l)(H)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install exterior finishes correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to install vertical siding with batten strips correctly.

TOOLS AND EQUIPMENT: Skill saw, handsaw, hammer, chalkline, 25 ft. tape measure, sawhorses, framing square, speed square, carpenter's pencil

MATERIALS: Plywood panels, 8 penny noncorrosive nails, caulk, water repellent, boards for corners, and battens

GENERAL INSTRUCTIONS: This activity can be used as a simulated work task in any building trades program. Student(s) can apply skills aquired in completing specified job task at a job site. Use blueprints or dimensions for area to be covered. Estimates should be made for the amount of material needed. List material and amount needed. Then, contact lumber yard for prices of material used. Use proper safety precautions.

PROCEDURES AND/OR TASKS:

1. List material needed for task.

2. List cost of materials.
3. Mark location of joints on sheathing.
4. If wall height is consistent, precut panels to correct length; otherwise, cut as panels are installed.
5. Use water repellent on edges of panels to be stained.
6. When necessary, rip panels to desired width.
7. Install the corner panel with the ripped edge at the corner.
8. Use full width panels with the edges touching the first window or door opening.
9. Measure the distance from the edge of the last full panel to the casing.
10. Measure from foundation line to drip cap of windows and doors, and to the sill of windows.
11. Mark panel for cutting, allowing a 1/8" gap on all sides; recheck measurements and markings.
12. Cut on the marked lines.
13. Install cut panel.
14. Measure from the edge of this panel to the opposite casing.
15. Using measurements in steps 8, 9, and 11, mark, cut, and install the opposite panel.
16. Repeat, as necessary, steps 6 though 14 toward the opposite corner.
17. Measure from last panel to the corner.
18. Cut panel to this dimension. The edge cut off should be the opposite of panel cut in step 4.
19. Install corner panel.
20. If necessary, install corner board.
21. Caulk around all joints and openings.
22. Place batten over each crack and nail, spacing every 24 inches.
23. Seal edges at corners with water repellent.
24. Have instructor check work.
25. Replace tools and material.
26. Clean work area.

II-7-B-JS-2

JOB SHEET

CARPENTRY

NAME______________________________ **DATE**________________________

UNIT: Exterior Finish

NAME OF JOB: Apply Bevel Siding

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(1)(H)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install exterior finishes correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to install bevel siding correctly.

TOOLS AND EQUIPMENT: Hammer, chalkline, framing square, 25 ft. steel tape, sawhorses, story pole, practice wall

MATERIALS: 6d nails, bevel siding, starter strips, 1" x 2" board for story pole, blueprint or dimensions given by instructor for area to be covered

GENERAL INSTRUCTIONS: This activity can be used as a simulated work task in any building trades program. Student(s) can apply skills aquired in completing specified job task at a job site. Use proper safety precautions.

PROCEDURES AND/OR TASKS:

1. Using blueprint or dimensions for task, estimate material needed.

2. Using local lumber yard, check prices and give estimate on cost.

3. Assemble tools, equipment, and materials.
4. Measure upward from the bottom of sheathing, and snap a chalk line.
5. Distance may vary with different types of siding and the exposure of each course.
6. Nail the starter strips along the bottom edge of the sheathing.
7. Secure continuous wood inside and outside corners.
8. Square the ends of the first board, and place one end against the left corner board with the top edge on the chalk line. Secure the top and bottom edges.
9. Center vertical joints over studs and stagger to hit studs.
10. Install the siding across to the right corner board.
11. Snap a chalk line for the second course and install it.
12. Make a story pole and lay off each course which will follow. After the first course is laid, a story pole can be laid out to determine the height of the next courses.
13. Have instructor check work.
14. Replace tools, equipment, and material.
15. Clean work area.

STUDENT INFORMATION SHEET

CARPENTRY

UNIT:	Exterior Finish
TOPIC:	Stucco Wall
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (e)(l)(H)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install exterior finishes correctly.
SPECIFIC OBJECTIVE(S):	After completing this information sheet, the student(s) will be able to install stucco walls correctly.
BASIC ACADEMIC SKILLS APPLICATION:	*Basic academic skills used when applying exterior wall finish will include mathematics and oral and written communications.*

STUCCO WALL FINISH

On a two-story building, balloon framing should be used. Cracks and distortions in stucco could be caused from shrinkage of joists when platform framing is done.

The stucco base is wood sheathing, sheathing paper, and a metal lath. It should be spaced 1/4 inch from the sheathing so the basecoat can be easily forced through and embedded into the lath. Galvanized furring nails, self-furring wire mesh, and metal furring strips are used. Nails should penetrate at least 3/4 inch through the sheathing. Be sure when using gypsum or fiberboard that nailing is done at the studs.

Metal or wood molding, with a groove that keys the stucco, is applied around the edges and openings. When workers apply the basecoat of stucco, a building or sheathing paper should be used over both the interior and exterior plywood sheathing.

Stucco can be tinted by adding coloring, or the surface can be painted with a suitable material.

This type of siding can be made up of various plasters and decorative patterns and colors. This mixture is used mostly for outside walls. Cement and materials used are applied wet. After it is dry, it becomes very hard and durable.

ASSIGNMENT SHEET
CARPENTRY

NAME______________________________ **DATE**________________________

UNIT: Exterior Finish

TOPIC: Stucco Wall

ESSENTIAL ELEMENT(S): (a)(7)(A)
(a)(7)(C)
(e)(l)(H)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install exterior finishing correctly.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will be able to install stucco walls correctly.

REFERENCES: II-7-C-IS

DIRECTIONS: Read and answer the following questions in the space provided.

1. What type stucco framing should be used for a two-story building?

2. Cracking and distortion can be caused by what?

3. What is used for the stucco base?

4. What type nails should be used with stucco?

5. When installing sheathing, nails should penetrate at least what?

6. Name two types of framing used with stucco.

II-7-C-JS-1

JOB SHEET

CARPENTRY

NAME______________________________ **DATE**________________________

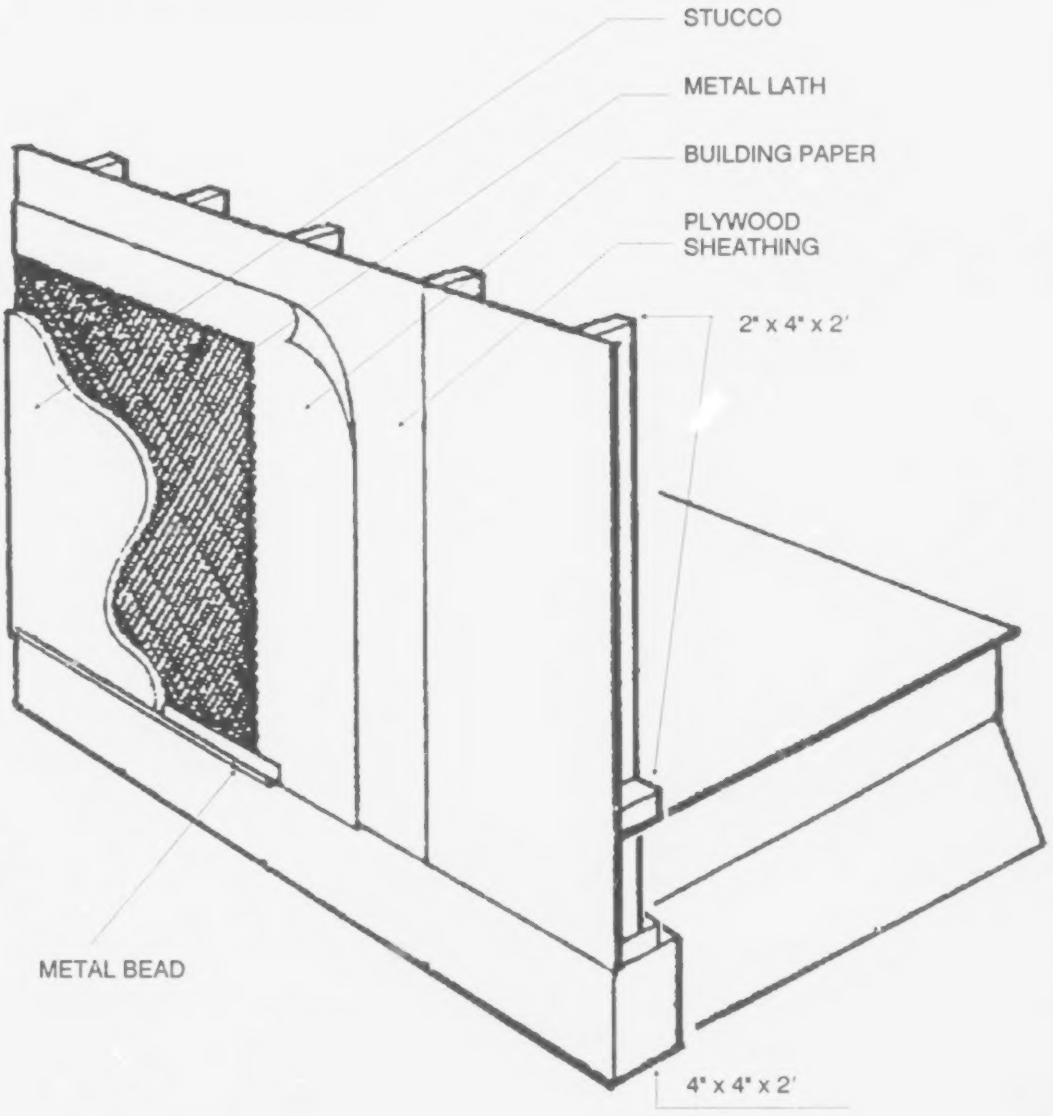
UNIT:	Exterior Finish
NAME OF JOB:	Construct Stucco Wall
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(1)(H)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install exterior finishes correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to construct a stucco wall correctly.
TOOLS AND EQUIPMENT:	Mortar board, cement hand trowel, hammer, framing square, chalkline, hacksaw, skill saw, noncorrosive nails
MATERIALS:	8 2" x 4" x 2' boards, 1 sheet 1/2" plywood, metal lath, 18 gauge 1" mesh, building paper, metal bead, blueprint, sketches
GENERAL INSTRUCTIONS:	This activity can be used as a simulated work task in any building trades program. Student(s) can apply skills aquired in completing specified job task at a job site. Blueprint provided by instructor for size of project. Have student measure and estimate material and cost to do one wall. Have student contact lumber yard or contractor for prices of material. Use proper safety precautions.

PROCEDURES AND/OR TASKS:

1. List materials needed.

2. List cost of material.
3. Construct simulated wall using drawing with task sheet.
4. Install lath 1/4" away from the sheathing.
5. Mix stucco plaster using one part portland cement, three parts sand, and hydrated lime 10% of the cement by volume.
6. Apply in three coats to a 1" thickness.
7. First coat is forced through the lath so that it is embedded in the lath at all points.
8. Repeat step 6 until desired thickness is reached.
9. Keep stucco mix wet, in shade, for at least three days since it is to be used on wall as drying occurs.
10. Have instructor check work.
11. Replace tools and materials.
12. Clean work area.

Stucco applied as an exterior covering over plywood sheathing.


STUCCO
METAL LATH
BUILDING PAPER
PLYWOOD SHEATHING
2" x 4" x 2'
METAL BEAD
4" x 4" x 2'

STUDENT INFORMATION SHEET

CARPENTRY

UNIT: Exterior Finish

TOPIC: Closed Cornice

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(e)(l)(H)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install exterior finishing correctly.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to install a closed cornice correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used when applying exterior wall finish will include mathematics and oral and written communications.*

CORNICE INFORMATION

The cornice (sometimes called the eave) is important to the architectural design of a home. One type of cornice is a closed cornice. The closed cornice has a rafter tail enclosed by a fascia, soffit, and trim.

The rake cornice extends up the slope of the roof at the wall and roof line. The closed cornice serves as a means of decorating, protects the walls by shedding water, and provides a surface for the installation of gutters. It also carries water to the downspout.

PARTS OF A CORNICE

The closed cornice has eight parts--the rough fascia, finish fascia, lookouts, soffit, drip edge, molding, frieze, and lookout ledger, as shown on TM-9.

The rough fascia is a 1" x 4" or 2" x 4" to provide a nailing surface for the finish fascia. The top of a rough fascia should be beveled to match the roof line.

A finish fascia is a 1" x 6" nailed to the rough fascia which has slots cut for the soffit and extends 1/2 inch below the soffit.

The soffit, or plancier, is the underside of the cornice. It is usually made of metal, hardboard, or plyboard and is 1/4 inch or 3/8 inch. Some soffits have ventilation openings with an aluminum cover or grill.

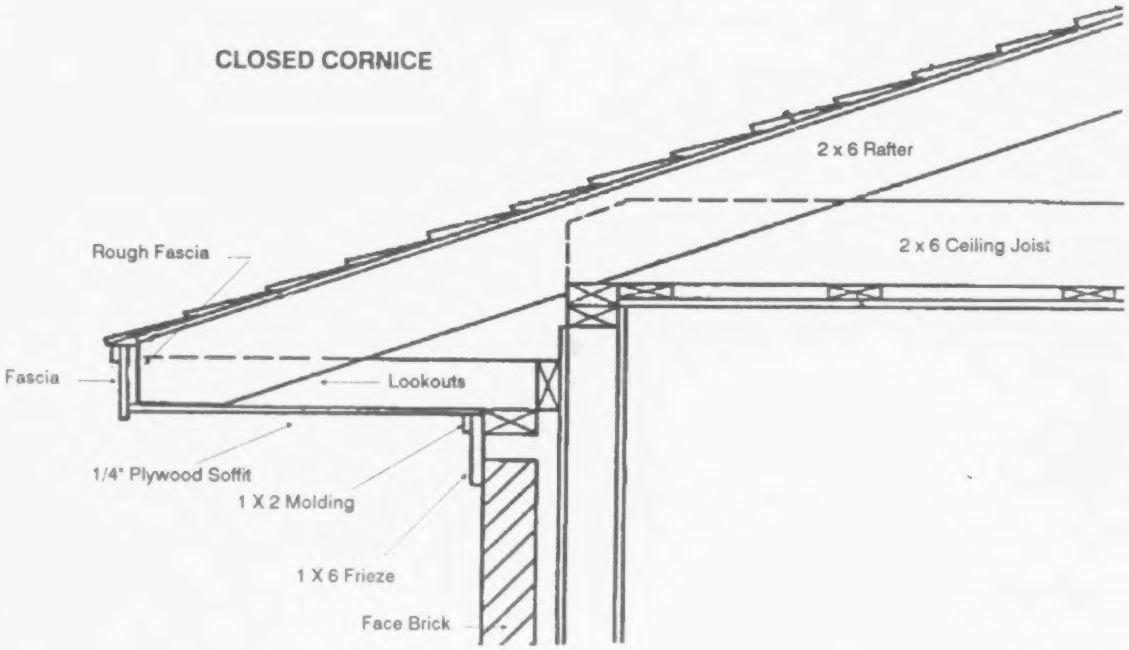
The lookouts are 2" x 2" or 2" x 4" horizontal parts used to support the soffit, and are spaced 16 to 48 inches on center. They extend from the lookout ledger to the end of the rafter.

Molding is used for decorating a flat surface and covering joints at the intersection of parts. A crown molding is usually used at the fascia and roofline.

The drip edge is placed over the roof sheathing and along the fascia to allow water to drip away from the cornice, and it is nailed to the fascia.

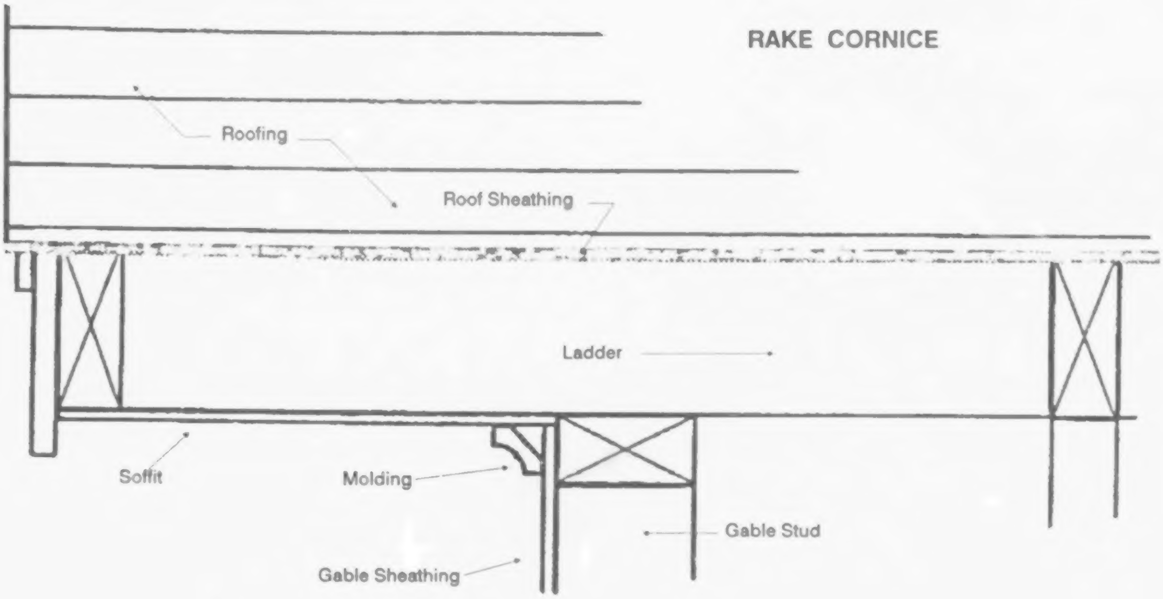
The frieze provides a closed space for brick or siding and a means to fill any void from the top of the window and soffit. With a brick veneer construction, the frieze is usually a 1" x 6" or 1" x 8", or molding, and should extend 1/2 inch below the end of the rafter.

The outlook ledger is a horizontal 1" x 4" nailed to the stud wall. It provides a nail base for the lookout and is placed a 1/2 inch below the rafter ends.



CLOSED CORNICE

2 x 6 Rafter
Rough Fascia
2 x 6 Ceiling Joist
Fascia
Lookouts
1/4" Plywood Soffit
1 X 2 Molding
1 X 6 Frieze
Face Brick



RAKE CORNICE

Roofing
Roof Sheathing
Ladder
Soffit
Molding
Gable Stud
Gable Sheathing

TM-9

ASSIGNMENT SHEET

CARPENTRY

NAME ______________________________ **DATE** ____________________________

UNIT: Exterior Finish

TOPIC: Closed Cornice

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(e)(l)(H)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install exterior finishing correctly.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will be able to install a closed cornice correctly.

REFERENCES: II-7-D-IS

DIRECTIONS: Read and answer the following questions in the space provided.

1. The strips of wood placed in internal corners are called ________________.

   A. eaves
   B. molding
   C. fascia
   D. rakes

2. A ______________ is used to protect sheathing and fascias from water.

   A. soffit
   B. lookout
   C. drip edge
   D. lookout

3. The drip edge is nailed to the __________________.

   A. frieze
   B. fascia
   C. soffit
   D. plancier

4. The eave is the same as the ___________________.

   A. rake
   B. cornice
   C. stoop
   D. ridge

5. The finish fascia is nailed to the ________________.

A. lookout
B. frieze
C. plancier
D. rough fascia

6. A closed cornice has ________________ parts to it.

A. 6
B. 8
C. 5
D. 9

7. The ________________ cornice extends up the slope of a roof.

A. open
B. rake
C. snub
D. box

8. The soffit is supported by the ________________.

A. plancier
B. lookout
C. joist
D. fascia

9. The ______________ is the underside of the cornice.

A. lookout
B. frieze
C. soffit
D. lookout ledger

10. The closed cornice is a means of decorating and helps ________________ the walls.

A. shade
B. protect
C. cover
D. support

11. A contractor figured labor would cost $90.00 per day for one worker. What would be the total labor cost for 5 days if 11 workers are employed? ____________

JOB SHEET
CARPENTRY

NAME________________________________ DATE__________________________

UNIT: Exterior Finish

NAME OF JOB: Sketch Cornice

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(e)(l)(H)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to demonstrate the correct knowledge associated with exterior finishing.

SPECIFIC OBJECTIVE(S): After completion of this lesson, the student(s) will have demonstrated the ability to identify and state the correct purpose of a cornice.

TOOLS AND EQUIPMENT: 12" ruler

MATERIALS: paper, pencil

GENERAL INSTRUCTIONS: Using TM-9, draw a sketch of the closed cornice.

PROCEDURES AND/OR TASKS:

1. Assemble materials needed to complete the task.

2. Draw and label sketch provided. It should be drawn to a larger scale and to instructor's satisfaction.

JOB SHEET
CARPENTRY

NAME______________________________ **DATE**_________________________

UNIT:	Exterior Finish
NAME OF JOB:	Estimating Soffit Material
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(l)(H)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install exterior finishes correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to estimate material and cost for soffit material correctly.
TOOLS AND EQUIPMENT:	Calculator, pencil, 25 ft. steel tape, 12" scale
MATERIALS:	Paper, blueprint or working drawing
GENERAL INSTRUCTIONS:	This activity can be used as a simulated work task in any building trades program. Student(s) can apply skills aquired in completing specified job task at a job site. Use blueprint provided by instructor.

PROCEDURES AND/OR TASKS:

1. Assemble tools, equipment, and material.
2. Decide on scale used on drawing.
3. Measure all dimensions pertaining to the soffit.

4. List all materials to be used.
5. Use local lumber yard for prices.
6. Using prices available, estimate the amount that material will cost.
7. Use formulas on page 225 in the appendix to estimate material.
8. Have instructor check work.
9. Replace tools and materials.
10. Clean work area.

STUDENT INFORMATION SHEET

CARPENTRY

UNIT: Exterior Finish

TOPIC: Gutters

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(e)(l)(H)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install exterior finishes correctly.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to install gutters correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used when applying exterior wall finish will include mathematics and oral and written communications.*

INFORMATION

Eaves troughs, or gutters, collect rainwater and carry it to downspouts which direct the water away from the foundation to a drainage point. An eaves trough is a waterway built onto the roof, over the cornice.

Eaves troughs are carefully built, because any leakage will penetrate the structure. This causes the cost of construction to increase, and guttering is cut from the project.

TYPES OF GUTTERS

Wood gutters made of red cedar or fir are used in some parts of the country and, if maintained, will last as long as the structure. They are usually made and installed before the roof has been shingled. These units are cut, drilled, and fitted on the ground and then set in place. Always use brass screws or a weatherproof nail. The edge of the roof will usually extend over the inside edge. This type of gutter will drain well if kept clean and sufficient downspouts are used.

Metal gutters are also available for water drainage. The gutter, downspouts, and various components have been perfected by manufacturers.

Systems include inside and outside corners, brackets, pipes, joints, and other items, and are held together with sheet metal screws or soft pop-rivots. Modern gutter systems include cornice trim. These units support the outside edge of a prefabricated soffit. This will save time, gives a nice appearance, and can be installed to existing fascia when remodeling.

There is also a vinyl plastic guttering system that has parts already formed that can be slipped together and easily installed.

ASSIGNMENT SHEET

CARPENTRY

NAME______________________________ **DATE**________________________

UNIT:	Exterior Finish
TOPIC:	Gutters
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (e)(l)(H)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install exterior finishing correctly.
SPECIFIC OBJECTIVE(S):	After completing this assignment sheet, the student(s) will be able to install gutters correctly.
REFERENCES:	II-7-E-IS
DIRECTIONS:	Read and answer the following questions in the space provided.

1. The gutter is also called a(n) _________________.

   A. outlet
   B. water trough
   C. eave trough
   D. collector

2. The gutters carry the water to the __________________.

   A. eave
   B. downspout
   C. outlet tube
   D. strainer

3. Wood gutters are made of __________________ and _______________ wood.

   A. pine, plywood
   B. red cedar, fir
   C. fir, pine
   D. pine, cedar

4. Downspouts are used to divert water ___________________.

   A. around the foundation
   B. away from the foundation
   C. to the ground
   D. off of cornice

5. Metal screws and pop-rivets are used to hold _______________ gutters together.

A. wood
B. vinyl
C. metal
D. metal and vinyl

6. Gutters are attached to the ___________________.

A. fascia
B. cornice
C. joist
D. eaves

7. The _____________________ type gutters are most economical.

A. wood
B. metal
C. plastic
D. none of the above

8. Often, gutters are not installed because they are _________.

A. hard to install
B. expensive
C. too heavy
D. none of the above

JOB SHEET
CARPENTRY

NAME______________________________ **DATE**________________________

UNIT:	Exterior Finish
NAME OF JOB:	Install a Metal Gutter
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(l)(H)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install gutters correctly.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to install gutters correctly.
TOOLS AND EQUIPMENT:	Hammer, 25 ft. steel tape, chalkline, 100 foot tape measure
MATERIALS:	Pop rivets or sheet metal screws, gutter, end caps, bar hangers, fascial apron, rectangular downspout clip, rectangular downspout tube, rectangular downspout, roof apron, inside and outside mitered corners, expansion joint, blueprints or working drawings
GENERAL INSTRUCTIONS:	This activity can be used as a simulated work task in any building trades program. Student(s) can apply skills aquired in completing specified job task at a job site. Gutters are used to collect and divert water away from eaves, lines, and foundation systems. Measure area of roof to be guttered, estimate material needed, and contact lumber yard for prices. Area to be covered furnished by instructor. List material and prices before starting task.

PROCEDURES AND/OR TASKS:

1. First, locate the high and low points of the gutter and snap a chalk line between them. If there are two conductor pipe outlets in the gutter, the high point will be located midway between the outlets.
2. Place a hanger along the chalk line.
3. The gutters should be placed in lengths in hangers; use joint connectors or expansion joints to assemble different pieces.
4. Where gutters turn, an inside or outside miter must be used.
5. Close the gutters with end caps.
6. Use gutter seal on all the joints.
7. Have instructor check work.
8. Replace tools and materials.
9. Clean work area.

APPENDIX II-A

FORMULAS

CARPENTRY

Stairway Calculations

For the number of risers, treads, and size, divide the total rise by the number of risers. (Example: total rise is 94", No. of risers 13--divide 13 into the total rise. 94" ÷ 13 = 7.23 or 7 1/4. Number of risers is 13, height is 7 1/4 in.)

Convert to feet and fractions of feet

cubic yards=width x length x thickness ÷ 27

Example: Concrete needed to pour 30 ft. x 42 ft. x 4 in.

cu. yd. = 30 x 42 x 4 ÷ 27 = 10 x 14 x 1 ÷ 9 = 140 ÷ 9 = 15.56 cu. yd.

Metric Conversion for length, area, and volume

Length: 1 meter (m) = 1000 millimeters (mm) = 100 centimeters (cm)

1 m = 3.28 ft.
1 cm = 0.39 in.
1 mm = 0.0394 in.

1 ft.= .305 m
1 in.= 2.54 cm
1 in.= 25.4 mm

Area: 1 Square Meter (m^2) = 10,000 Square Centimeters (cm^2)

1 m^2 = 1.2 yd.^{2}
1 m^2 = 10.8 ft.^{2}
1 cm^2 = .155 in.^{2}

1 yd.^{2} = .836 m^2
1 ft.^{2} = .093 m^2
1 in.^{2}= 6.45 cm^2

Volume: 1 Cubic Meter (m^3) = 10,000 Cubic Centimeters (cm^3)
1 Cubic Decimeter = 1 dm^3 = 1 liter

1 m^3 = 1.31 yd.^{3}
1 m^3 = 35.3 ft.^{3}
1 cm^3 = .061 in.^{3}

1 yd.^{3} = 0.765 m^3
1 ft.^{3} = 0.028 m^3
1 in.^{3}= 16.39 cm^3

Metric Lumber Dimensions

2" x 4"	50 mm x 100 mm
2" x 6"	50 mm x 150 mm
2" x 8"	50 mm x 200 mm
2" x 10"	50 mm x 250 mm

Residential plan views are drawn to 1/4 in. scale. (1/4" = 1′ 0")

Detail sections are drawn to larger scale, 1" = 1′ 0".

APPENDIX II-B

GLOSSARY

CARPENTRY

Acoustical materials--Types of tile, plaster, and materials that absorb sound waves.

Adhesive--Term used that includes cement, mastic, glue, and paste.

Aggregate--Materials used to make concrete, such as sand, gravel, and rock.

Anchor bolt--Bolts set in concrete to hold the structure members in place.

Apron--Horizontal pieces of trim applied against the wall below the stool, to cover rough edges of plaster.

Asphalt--Is soluble in gas and melts if heated. It is used for floor tile, waterproofing roof covering, and exterior wall coverings.

Backfill--To replace earth around foundations after excavating.

Baluster--A spindle-like vertical stair member that supports the stair rail.

Base shoe--A narrow molding used where the baseboard meets the finished floor.

Batten--A strip of wood used to cover surface of joints.

Beam--A structure member used between posts, walls, and columns.

Bearing partition--Supports the vertical load in addition to its own weight.

Bedding--A mortar, putty, or other substance used to secure a firm bearing.

Bevel--To cut an angle other than a right angle on the edge of a board or door.

Blemish--A scar or mark that distracts from the wood's appearance.

Board--Lumber less than 2-inches thick.

Bracket--A projecting support for a shelf or other structure.

Cabinet--A box type assembly consisting of shelves, drawers, and doors used for storage.

Cased opening-- An interior opening without a door that is finished with jambs or trim.

Casing--Trim around a door, window, beam, either inside or outside.

Closet pole--A round molding installed in clothes closets to accommodate clothes hangers.

Conductors--Pipes conducting water from a roof to the ground.

Conduit electrical--Pipe or tube, usually metal, used when wiring is installed.

Convenience outlet--An electric outlet used for portable equipment, such as lamps.

Counterflashing--Flashing used around chimneys at roofline to prevent moisture entry.

Cupola--A small, four-sided structure installed on the roof that provides ventilation for the attic.

Dado--A rectangular groove cut in wood across the grain.

Dimension lumber--Is 2- to 5-inches thick, and up to 12-inches wide.

Door frame--Wood parts that form an enclosure and support the door.

Door stop--Trim nailed to door jambs to stop the door from swinging through.

Dry rot--Term applied to types of decay which in advanced stages permits wood to be easily crushed into a dry powder.

Drywall-Sheeted materials used for wallcovering that do not need to be mixed with water to apply.

Eaves--Lower parts of a roof that extend over an exterior wall.

Elevation--Height of an object above the grade level.

Escutcheon--A protective plate or shield containing a keyhole.

Facade--Front or main elevation of a building.

Fascia--Wood used for outer face of a box cornice that is nailed to end of rafters.

Fiberboard--Material of varying densities, made from wood, cane, or vegetable fibers.

Fire wall--Wall that subdivides a building to restrict the spread of fire.

Flashing--Sheet metal or materials used in roof and wall construction to prevent moisture from entering.

Footing--Spreading course at the base of a foundation wall, pier, or column.

Framing--Timber structure which gives a building shape and strength.

Furring--Small strips of wood spaced to give a nailing base for other material.

Girder--Principal beam that supports concentrated loads at particular points.

Grout--Is a thin mortar used in masonry work.

Header--Horizontal support to carry load over an opening such as a window or door.

Headroom--Clear space between floor line and ceiling, as in a stairway.

Hip roof--Roof that rises from all four sides of a building.

Horn--Extension of a stile, sill, or jamb.

Incinerator--Device to consume household waste by burning.

Interior trim--Term for baseboards, casings, and moldings installed by finish carpenters.

Jamb--Two sides of a door or window frame that contact the door or sash; top jamb and side jambs.

Jig--Device used to position material for accurate cuts.

Kiln dried--Wood cured in a kiln using artificial heat, controlled humidity and air circulation.

Knot--Limb or branch cut through during lumber processes.

Lazy Susan--Circular, rotating shelf used in corners of cabinets.

Leader--A downspout.

Level-transit--Surveying instrument used to check plumb of walls and new structures.

Linear foot--Having length only; a line one-foot long.

Line load--Total of all variable loads placed on a building.

Masonry--Brick, tile, stone, concrete block, gypsum block, or combination of similar material, bonded together with mortar.

Medallion--Raised, decorative piece.

Moisture content--Amount of water contained in wood.

Moulder--A woodworking machine designed to run moldings with irregular cuts.

Net floor area--The gross floor area, minus the area of partitions, columns, stairs, and other floor openings.

Nosing--Part of a stair riser which projects over the riser in the rounded edge of a board.

On Center--Indicates spacing of framing members by stating from the center of one member to the center of the following member.

Open-grain wood--Wood such as oak, ash, walnut, and chestnut.

Parapet--The part of a wall that extends above the roof.

Particleboard--Made from wood shavings, slivers, etc., which are bonded together with synthetic resins.

Partition--Wall that subdivides any space in a story of a building.

Penny--Term used for length of nails.

Pier--Column of masonry used to support other structural members.

Pile--Pillar of concrete, metal, or heavy timber placed in the earth and used as a foundation member.

Pitch--Slope or incline used for stairs and roofs; rise divided by the span.

Plan--Drawing showing floors, cross-sections, horizontal plane, or other objects.

Plaster--Mixture of lime, sand, and cement used to cover inside and outside of wall surface.

Plat--Map, plan, chart of town, city, subdivision; plans indicating boundaries of individual property.

Plot plan--Shows distance from a structure to a property line.

Plumb--Exactly perpendicular or vertical.

Plumbing--The business of installing pipe, fixtures for serving water and removing liquid and water-born waste.

Portico--A porch with a continuous row of columns.

Purlins--Horizontal roof members used to support rafters between the plate and ridge board.

Quarter round--A small molding with a cross-section of one-fourth a cylinder.

Rabbet--Rectangular shape consisting of two surfaces cut along the edge of a board.

Ramp--An inclined plane connecting different levels.

Retaining wall--A wall built to support lateral pressure.

Riser--Vertical stair member between two consecutive stair treads.

Roofing--Materials applied to the structure to make it waterproof.

Rough lumber--Lumber cut to size but which has not been surfaced.

R-Value--Efficiency value of insulation like fiberglass batting, foam, or similar materials.

Sash--Framework that holds glass in windows.

Scaffold--A temporary work platform to support workers and materials.

Scantling--Lumber with a cross-section rating from 2 inches x 4 inches to 4 inches x 4 inches.

Scotis--Used under the nosing of stair treads.

Screed--Tool used to work concrete.

Seasoning--To remove moisture from green wood.

Septic tank--Sewage settling tank used to decompose organic sludge solids by bacterial action.

Shakes--Handsplit shingles.

Shim--A thin, wedge-shaped piece of wood.

Side of trim--Trim needed to finish one side of a window or door opening.

Sill--Lowest part of a window or outside doorframe.

Skylight--Glazing framed into a roof.

Soffit--Underside of staircases, beams, cornices, and arches.

Soleplate--Lowest horizontal part in a wall in partition framing.

Span--Distance between columns, walls, girders, and trusses.

Square--Unit of measurement used to figure roofing material.

Stairwell--Framed opening that receives the stairs.

Stoop--A small porch or platform.

Stud--Wood or metal members of walls and partitions.

Subfloor--Materials laid directly on floor joists on which a finished floor will be laid.

Terrazzo flooring--Chips of marble or colored stone placed in concrete; then the surface is ground and polished.

Thermostat--Automatically controls heating and cooling devices.

Timbers--Lumber 5 inches or larger in its least dimension.

Toenailing--Driving nails at a slant with the initial surface in order to penetrate a second member.

Tread--Horizontal part of a step on which the foot is placed.

Trimmer--Floor joist into which a header is framed.

Trimmer stud--Supports the header for a wall opening.

Truss--Provides a support over wide spans with a minimum amount of material.

Unprotected-metal construction--Construction that is of metal unprotected by fireproofing.

Valley--An internal angle made by two slopes of a roof.

Wainscot--A lower, interior wall surface that contrasts with the wall surface above.

Warp--A bow, crook, cup, twist, or combination thereof.

Weatherstrip--Designed so that when installed at doors and windows, it will retard the passage of air, water, moisture, or dust around the window or door sash.

Weep hole--Used at lower edges of masonry walls to drain water to the outside.

Window unit--Consists of the frame, window, weatherstripping, and sash activation device; may also include screen or storm sash.

Wing--A lateral extension from the main building.

Wire glass--Glass with a layer of meshed wire installed approximately in center of the sheet of glass.

STUDENT INFORMATION SHEET
MASONRY

UNIT:	Orientation
TOPIC:	Careers in Masonry Field
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (e)(2)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to demonstrate an awareness of career opportunities in the masonry field correctly.
SPECIFIC OBJECTIVE(S):	After completing this information sheet, the student(s) will identify and state the purpose of career opportunities in the masonry field correctly.
BASIC ACADEMIC SKILLS APPLICATION:	*Basic academic skills used with the orientation to masonry will include oral and written communications and reading concepts and skills.*

WHAT MASONS DO

The term *masonry* has always referred to the craft of building with brick. Today it has a broader meaning. It includes two types of work. The first type consists of any construction bonded together with mortar. The second type deals with cement masonry. All who lay brick, block, tile, or stone are called *masons*.

They must learn to proportion the ingredients of mortar, figure trade-related problems, mix and spread mortar, read blueprints, and handle different kinds of masonry units.

ADVANCEMENT OPPORTUNITIES

The masonry trade recognizes various levels of the skill.

They are:

1. **Apprentice**--a person at least 17 years old and, preferably, not over 24 years old.

2. **Journeyman***--an experienced craftsworker who has successfully completed an apprenticeship in the trade.

3. **Supervisor**--a journeyman who has the responsibility of supervising a group of workers.

4. **Superintendent**--generally, a supervisor who has been promoted because of outstanding performance.

WORKING CONDITIONS

Bricklayers and stonemasons normally work outdoors, unless freezing conditions or rain prevail. Masons have to be able to lift heavy materials, stand, kneel, and bend, sometimes for long periods. Masons are subject to injuries from working on scaffolds--either from falls or tools falling from the scaffolds.

Masons must be able to read and understand blueprints and specifications to build structures drawn by the architect.

*The current licensing process uses the term *journeyman*.

ASSIGNMENT SHEET

MASONRY

NAME: ______________________________ **DATE:** ____________________

UNIT:	Orientation
TOPIC:	Careers in Masonry Field
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (e)(2)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to demonstrate an awareness of career opportunities in the masonry field correctly.
SPECIFIC OBJECTIVE(S):	After completing this assignment sheet, the student(s) will identify and state the purpose of career opportunities in the masonry field correctly.
REFERENCE:	III-1-A-IS B.T. I-Unit IV
DIRECTIONS:	Using the *Occupational Outlook Handbook*, write a report about masonry on "Nature of the Work" and "Job Outlook."

STUDENT INFORMATION SHEET

MASONRY

UNIT:	Orientation
TOPIC:	Related Occupations
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (e)(2)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to demonstrate an awareness of career opportunities in the masonry field correctly.
SPECIFIC OBJECTIVE(S):	After completing this information sheet, the student(s) will identify and state the purpose of related occupations in the masonry field correctly.
BASIC ACADEMIC SKILLS APPLICATION:	*Basic academic skills used with the orientation to masonry will include oral and written communications and reading concepts and skills.*

RELATED OCCUPATIONS

Bricklayers and stonemasons have a thorough knowledge of brick, stone, and marble and have the skill to make very attractive, yet highly durable, structures. Workers in other occupations with similar skills include tile setters, plasterers, terrazzo workers, and concrete masons.

About one out of three bricklayers and stonemasons is self-employed. Many of those self-employed specialize in contracting on small jobs such as patios, walks, and fireplaces.

ASSIGNMENT SHEET

MASONRY

NAME: ________________________________ **DATE:** ____________________

UNIT: Orientation

TOPIC: Related Occupations

ESSENTIAL ELEMENT(S): (a)(7)(A)
(a)(7)(C)
(e)(2)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to demonstrate an awareness of career opportunities in the masonry field correctly.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will identify and state the purpose of related occupations in the masonry field correctly.

REFERENCE: III-1-B-IS
B.T. I-Unit IV

DIRECTIONS: Read and answer each of the following questions in the space provided.

1. Bricklayers and stonemasons need a thorough knowledge of what?

2. What are some other occupations involving similar skills?

3. How many bricklayers and stonemasons are self-employed?

4. In what jobs do self-employed bricklayers and stonemasons specialize?

5. The apprentice should be what age?

6. What is a journeyman mason?

7. If a mason could lay 180 bricks in one hour, how many could he lay in 6 hours?

8. A mason purchased a piece of equipment for $2,500.00 and agreed to pay 8% interest per year. How much interest would be owed in 12 months?

Read each of the following statements. Indicate if the statement is **true** or **false** by circling **T** or **F**.

T F 9. Masons must be able to read blueprints.

T F 10. Terrazzo workers do not work with masons.

T F 11. A tile setter does not have skills similar to those of bricklayers and stonemasons.

T F 12. Bricklayers and stonemasons must serve as apprentices.

STUDENT INFORMATION SHEET

MASONRY

UNIT: Tools and Materials

TOPIC: Finishing Tools

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(2)

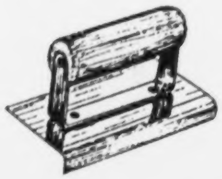
UNIT OBJECTIVE: After completing this unit, the student(s) will be able to demonstrate the correct use of finishing tools and heavy equipment used in bricklaying/stonemasonry.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to use edgers, groovers, floats, and power joint cutters correctly, which are used in bricklaying/stonemasonry.

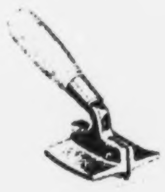
BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used with tools and materials will include application of reading concepts and skills and oral and written communications.*

TYPES OF TOOLS

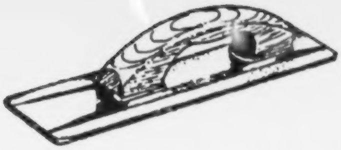
The **edger** is a tool with one edge curved down to form an arc with a 1/8- to 1 1/2-inch radius. It's used in rounding off sharp edges of concrete slab and sidewalks, improving appearance, and reducing edge damage.



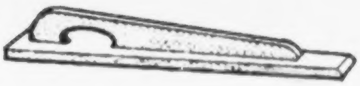
The **groover** is a tool with a longitudinal projection, called a bit, down the middle of the tooling surface. Bits may be from 3/16 to 1 inch in length.



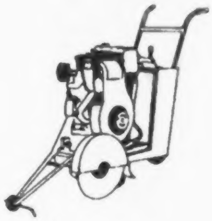
Floats are used to prepare the concrete for finishing. Floats are made of wood, aluminum, or magnesium; they are 10 to 20 inches long and 3 to 4 inches wide.



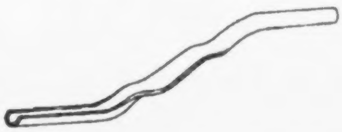
A **darby** is a long, flat, rectangular piece of wood, aluminum, or magnesium which is usually 30 to 80 inches long and 3 to 4 inches wide. It is used to float the surface of the concrete slab.



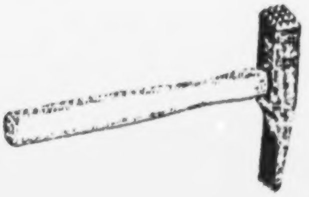
The **power joint cutters** are used on larger jobs to cut control joints. They are actually power saws with special diamond, or shatterproof, abrasive blades.



The **metal concave beading tool** is used to repoint mortar joints after they have been raked out. The mortar is pressed into the joint with a concave bead jointer.



The **face hammer** is shaped like a sledge hammer but has one blade tapered to an edge. It is also called a *stone ax* and weighs four to six pounds.



The **mash hammer** is used with a chisel to cut stones into smaller pieces that can, in turn, be cut with a chisel. It usually weighs two to four pounds.

The **small bush hammer** is for trimming soft stone and dressing the edges of stone.

ASSIGNMENT SHEET
MASONRY

NAME: ______________________________ **DATE:** ____________________

UNIT: Tools and Materials

TOPIC: Finishing Tools

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(2)

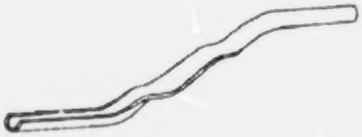
UNIT OBJECTIVE: After completing this unit, the student(s) will be able to demonstrate the correct use of finishing tools and heavy equipment used in bricklaying/stonemasonry.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will be able to use edgers, groovers, floats, and power joint cutters correctly , which are used in bricklaying/stonemasonry.

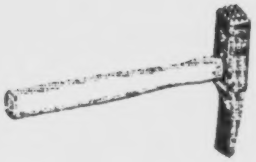
REFERENCE:
III-2-A-IS
B.T. I-Unit IV

DIRECTIONS: Identify each of the following masonry tools by placing the correct letter in the blank provided and give a brief description of each.

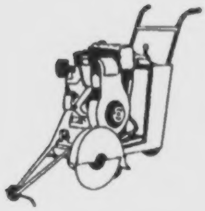
A. **Edger**
B. **Groover**
C. **Float**
D. **Power joint cutter**
E. **Darby**
F. **Metal concave beading tool**
G. **Face hammer**
H. **Mash hammer**
I. **Bush hammer**



1.______________________________



2.________________________



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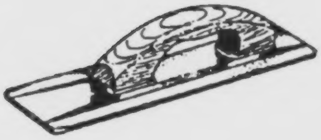
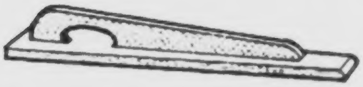
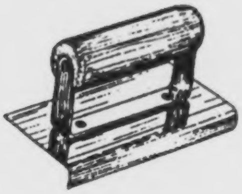


4.________________________

5.________________________



6.________________________



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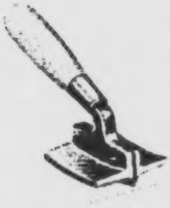


8.______________________________

9.______________________________

JOB SHEET

MASONRY

NAME: ______________________________ **DATE:** ________________

UNIT: Masonry

NAME OF JOB: Tool Identification

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to demonstrate the correct use of finishing tools and heavy equipment used in bricklaying/stonemasonry.

SPECIFIC OBJECTIVE(S): Upon completion of this lesson, the student(s) will be able to identify and explain the correct use of masonry tools.

TOOLS AND EQUIPMENT: Edger, groover, float, power joint cutter, darby, metal concave beading tool, face hammer, mash hammer, bush hammer

MATERIALS: N/A

GENERAL INSTRUCTIONS: A mason depends a great deal on the condition and the quality of the tools he uses. Therefore, it is important for students to be able to identify and discuss the tools used in masonry.

PROCEDURES AND/OR TASKS:

1. Have student set up a display of all finish tools and masonry tools.

2. Label each tool.
3. Write a description of each tool and its use.
4. Aquire prices on each tool.
5. Post price by each tool.
6. Discuss why poorly-made tools should not be purchased.
7. Discuss why a mason should purchase tools from a well-known company.
8. Have instructor evaluate presentation.
9. Clean area.

STUDENT INFORMATION SHEET
MASONRY

UNIT: Tools and Materials

TOPIC: Heavy Equipment

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(e)(7)(E)
(e)(2)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to demonstrate the correct use of finishing tools and heavy equipment used in bricklaying/stonemasonry.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to use the heavy equipment used in bricklaying/stonemasonry correctly .

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used with tools and materials will include application of reading concepts and skills and oral and written communications.*

POWER TROWELER

A power troweler is used for large jobs and has three or four rotating steel trowel blades. They are powered by electricity or gasoline engines. The purpose of troweling is to give the surface a smooth, dense finish.

POWER SCREED

A screed is a straight edge made of any straight piece of wood or metal that has sufficient rigidity. It is the first finishing tool used by the cement mason after the concrete is placed. A power screed is used for large jobs and is powered by electricity or gasoline engines.

BRICK BUGGY

The brick buggy usually requires a fairly good, flat surface to operate. This machine is operated by a gasoline engine. This machine has an adjustable hydraulic lift which provides access from the lowest to the highest point on the scaffolds.

ASSIGNMENT SHEET
MASONRY

NAME: ______________________________ **DATE:** ____________________

UNIT: Tools and Materials

TOPIC: Heavy Equipment

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(2)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to demonstrate the correct use of finishing tools and heavy equipment used in bricklaying/stonemasonry.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to use the heavy equipment used in bricklaying/stonemasonry correctly .

REFERENCE:
III-2-B-IS
B.T. I-Unit IV

DIRECTIONS: Read the following questions and answer in space provided below.

1. How may power trowelers be powered?

2. A troweler is used to give what type of finish?

3. What is the first finishing tool used after concrete is placed?

4. Describe how a power screed is made.

5. What type of lift is used on a brick buggy?

6. A tool shed usually has 100 tools, and fourteen are missing. What percent of the tools are missing?

7. A contractor bought a compressor regularly selling for $120.00 at a sale and saved 20 percent. How much money did he save?

JOB SHEET

MASONRY

NAME: ______________________________ **DATE:** ________________

UNIT:	Tools and Materials
NAME OF JOB:	Mixing Mortar with the Power Mixer
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(2)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to demonstrate the correct use of finishing tools and heavy equipment used in bricklaying/stonemasonry.
SPECIFIC OBJECTIVE(S):	Upon completing this lesson, the student(s) will be able to use power mixers to mix mortar correctly.
TOOLS AND EQUIPMENT:	5 gallon can, power mixer (gas-powered), trowel, shovel, mortar box
MATERIALS:	Portland cement, 1 bag lime, sand, water and other materials required
GENERAL INSTRUCTIONS:	When using a mechanical mixer (gasoline-powered or electrically driven) it and all the materials should be near the area where the work is being done. On large jobs, the mixer should be placed on blocks. Instructor should make arrangements to visit a contractor to learn the use of power mixers. Use proper safety precautions. Safety goggles or glasses should be worn.

PROCEDURES AND/OR TASKS:

1. Turn mixer on.
2. Add a small amount of water to prevent materials sticking to the sides of the mixing drum. This will also help prevent mortar from caking on the machine paddles as they whip through the mix.
3. Add one-half to one-third of the sand needed for the total mix.
4. Add sand to mixer while paddles are turning. This prevents strain on the motor.

   CAUTION: Be sure that the shovel is not used in mixer while operating. This could be caught in the paddles and severely injure someone.

5. Add necessary amount of portland cement, lime, or masonry cement to the mixing drum.
6. Lay the bag on the safety grate and cut open with knife, old trowel, or pull tag on the corner of the bag to release the material.

   CAUTION: Never put hand inside safety grate to remove pieces of bag while mixer is running.

7. Add the remainder of the sand to the mixer.
8. Add water at this time to get the desired mortar consistency.
9. Allow mixer to run three to five minutes so that all materials are thoroughly blended.
10. Avoid prolonged mixing.
11. After mixing, grasp the drum by the dumping handle while mixer is still running, and dump the mortar into the mortar box or wheelbarrow.
12. Stop mixer and clean remainder of mortar out of drum.
13. Start mixer again, add water and let run to clean drum and paddles.
14. Stop mixer, scrub with stiff brush to remove mortar.
15. Flush with enough water to remove all mortar.
16. Have instructor check work.
17. Replace tools and materials.
18. Clean work area.
19. Safety procedures and practices must be emphasized when operating power mixers or any heavy equipment.

STUDENT INFORMATION SHEET

MASONRY

UNIT: Basic Information for Bricklaying/Stonemasonry

TOPIC: Mortar Consistency

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(2)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to mix mortar, build a stone wall, and clean stonework correctly .

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to mix mortar correctly .

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used with the basic information for bricklaying/stonemasonry will include mathematics, oral and written communications, and the application of reading concepts and skills.*

MORTAR CONSISTENCY

Mortar on the board should be kept tempered with water. Avoid constantly working the mixture. This causes the mortar to dry out and become stiff so that it does not spread well. Be sure to use mortar before it begins to set up.

Mortar serves four functions:

1. It bonds units together.
2. It makes up the difference in unit size.
3. It provides bonding for metal or other reinforcing material.
4. It provides a nice look and quality by creating pleasing lines and color effects.

MORTAR PROPERTIES

Mortar has two sets of properties:

1. Plastic
   a. Workability
   b. Water retention

2. Hardened
   a. Compressive strength
   b. Bond strength
   c. Durability

Plastic mortar, or mortar just mixed must be workable, uniform, cohesive, and of a consistency that makes it useable.

Water retention is the ability to prevent mixing water from being lost by absorption into masonry or evaporation on a hot day.

Compressive strength of mortar increases as the cement content is increased.

Bond strength refers to mortar with good workability that will ensure a good bond. Mortar should be placed in final position within 2 1/2 hours after the original mixing.

Durability of mortar is the ability to resist repeated cycles of freezing and thawing.

ASSIGNMENT SHEET

MASONRY

NAME: ______________________________ **DATE:** ____________________

UNIT:	Basic Information for Bricklaying/Stonemasonry
TOPIC:	Mortar Consistency
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(2)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to mix mortar, build a stone wall, and clean stonework correctly.
SPECIFIC OBJECTIVE(S):	After completing this assignment sheet, the student(s) will be able to mix mortar correctly.
REFERENCE:	III-3-A-IS B.T. I-Unit IV
DIRECTIONS:	Read and answer each of the following questions in the space provided.

1. Why should mortar not be constantly worked?

2. Why should mortar have water sprinkled on it?

615

3. What four functions does mortar serve?

4. What are the two distinct sets of properties of mortar?

5. What is plastic mortar?

6. What does compressive strength mean?

7. Water retention is the ability to do what?

8. What is known as the ability to resist repeated cycles of freezing and thawing?

9. A mason estimates the following amounts of mortar for a job: 5 1/2 cubic yards, 11 1/3 cubic yards, and 6 1/4 cubic yards. What would be the total amount of mortar needed for the job? ________________cubic yards of mortar.

10. Weight slips of four loads of gravel delivered to the job site were 6,282 lbs., 6,099 lbs., and 6,195 lbs. What is the total weight of gravel delivered to the job? ______ total weight.

JOB SHEET

MASONRY

NAME: ______________________________ **DATE:** ____________________

UNIT: Basic Information for Bricklaying/Stonemasonry

NAME OF JOB: Making Stepping Stones

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(2)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to mix mortar, build a stone wall, and clean stonework correctly.

SPECIFIC OBJECTIVE(S): Upon completion of this lesson, the student(s) will demonstrate the ability to make stepping stones used for walkways and patios correctly.

TOOLS AND EQUIPMENT: Handsaw, band clamps, hoe, plastic buckets, 2-ft. sq. plywood, screwdriver, pliers, and shovel

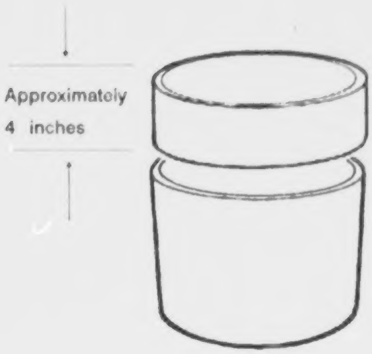
MATERIALS: 1 bag of premixed Sakrete, marbles, colored stones, water, and a 2-ft. 2" x 4"

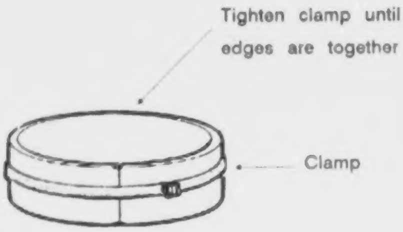
GENERAL INSTRUCTIONS: When working with mortar or concrete, it is important to learn to mix materials and use them in different ways.

PROCEDURES AND/OR TASKS:

1. Assemble tools and equipment in one area.

2. Cut a 4-inch section (the desired height of the stepping stone) off the top of a plastic bucket. Then, cut through one side of the section and attach the clamp, tightening until edges are together.





3. Set ring on plywood or sand.
4. Open Sakrete and pour into wheel barrow or mortar box.
5. Add water to Sakrete per directions on sack.
6. Take hoe and work mixture back and forth until it is mixed thoroughly and is stiff. Use just enough water to keep it damp.
7. After mixing, take a shovel and fill the ring to the top.
8. Smooth off top with 2" x 4".
9. Lay marbles on top of mix and press them down until just the tops are visible.
10. Let set and dry.
11. After dried, loosen clamp and remove plastic ring.
12. Marbles can also be sanded off and lacquered.

These are items that can be used to make money for fund-raisers.

Designs can be made using the marbles or stone.

STUDENT INFORMATION SHEET

MASONRY

UNIT: Basic Information for Bricklaying/Stonemasonry

TOPIC: Building a Stone Wall

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(2)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to mix mortar, build a stone wall, and clean stonework correctly.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to build a stone wall correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used with the basic information for bricklaying/stone masonry will include mathematics, oral and written communications, and the application of reading concepts and skills.*

BUILDING A SOLID STONE WALL

The wall will depend on bondstones for strength and stability, and for tying the wall together. A *bondstone* is a stone that passes through the wall from side to side. (See TM-1.) Bondstones should be placed as frequently as possible. Every five to eight square feet of wall should have one.

In a solid stone wall, the stone provides structural support as well as covering. The usual wall thickness is a minimum of 18 inches. Larger stones may be used and should be placed in natural positions for best appearance.

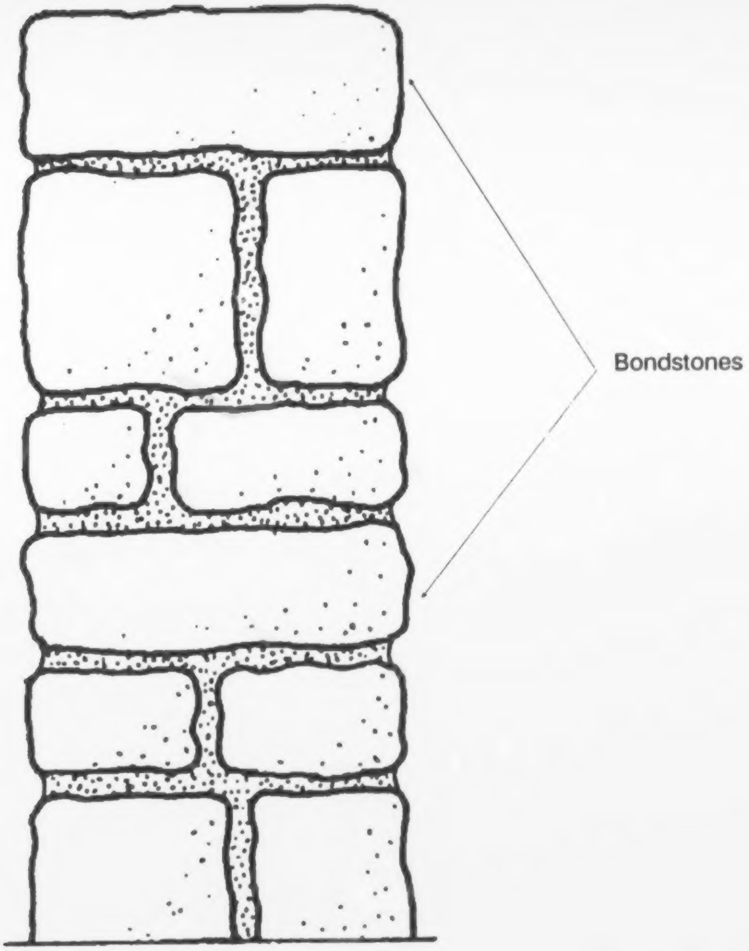
Reinforcing may be used in a solid stone wall to give added strength and support.

STONE MORTAR

A good stone mortar has to be strong and elastic. If too much Portland cement and sand are added to the mix, it will be too rich and brittle. If hydrated lime is added to the mix, it will make the mortar workable and provide a good bond with the stone.

A good mix to use for stonework is Type N mortar in a ratio of 1 part Portland cement to 1 part hydrated lime to 6 parts sand. If the sand is coarse, use 5 parts sand. Type N mortar is recommended for all exterior walls except retainer walls.

Mortar will not be absorbed very quickly because of the stones' hardness and denseness. Adding lime to mixes will help create a better bond. Washed building sand is the best to use.


Bondstones

621

TM-1

ASSIGNMENT SHEET
MASONRY

NAME: ______________________________ DATE: ____________________

UNIT:	Basic Information for Bricklaying/Stonemasonry
TOPIC:	Building a Stone Wall
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(2)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to mix mortar, build a stone wall, and clean stonework correctly.
SPECIFIC OBJECTIVE(S):	After completing this assignment sheet, the student(s) will be able to build a stone wall correctly.
REFERENCE:	III-3-B-IS B.T. I-Unit IV
DIRECTIONS:	Read and answer each of the following questions in the space provided.

1. The stone wall will depend on what for strength and stability?

2. How often should bondstones be placed?

3. What is the minimum wall thickness?

4. What can be added to give the wall strength and support?

5. What is a bondstone?

6. What will happen if stone mortar is too rich?

7. What can be added to mortar to make it bond better to stone?

8. What type mortar should be used for stonework?

9. Why is mortar not absorbed quickly when doing stonework?

10. What type sand is best to use for mortar mixes?

JOB SHEET

MASONRY

NAME: ______________________ **DATE:** ______________

UNIT: Tools and Materials

NAME OF JOB: Construct a Stone Wall

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(2)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to mix mortar, build a stone wall, and clean stonework correctly.

SPECIFIC OBJECTIVE(S): Upon completing this lesson, the student(s) will be able to build a stone wall correctly.

TOOLS AND EQUIPMENT: Trowel, stone mason's hammer, caulking trowel, shovel, hoe, level and mason line, chalk marker, sledge hammer

MATERIALS: Mortar mix nonstaining cement, hydrated lime, washed sandstone ties, noncorrosive plastic or wood pads, stone rubble

GENERAL INSTRUCTIONS: This activity can be used as a simulated work task in any building trades program. Students can apply skills aquired in completing specified job tasks at a job site. Instructor furnishes print or dimensions to be used. Use proper safety precautions.

PROCEDURES AND/OR TASKS:

1. Examine stone to be used. Stones will vary in size from 6" to 18" inches.
2. Mix only enough mortar to last for 1 hour of work; Use mix before it sets.

3. Use nonstaining mortar.
4. Mix 1 part nonstaining cement, 1 part hydrated lime, 6 parts washed sand.
5. A manufactured mix can be used.
6. Use large stones for base and mark with chalk if edges need to be cut.
7. Place stones in position and dry in natural position as possible.
8. If large stones need to be cut, use a sledge hammer.
9. Trim stones as you lay them to be sure they are clean.
10. Place each stone and check for fit.
11. Using a trowel, lay a full bed of mortar for the trimmed stones and place them in position.
12. Fill spaces between stones with mortar using a narrow caulking trowel to help work mortar into crevices.
13. Make joints 1/2- to 1-inch wide.
14. Sponge stonework free of water as work progresses; This will help keep stones clean.
15. Remove any excess mortar with a trowel and strike the joint.
16. Joints can be tooled when set, and can be raked out 1 inch deep and pointed later.
17. Trim other stones for deeper bed course and fit them in place using the same procedures.
18. Bend the noncorrosive ties into place for successive courses of stone.
19. Use extra ties for corners and large stones.
20. Place plastic or wood pads between heavy stones so mortar will not be squeezed out.
21. Pads can be removed and filled when mortar has set.
22. Heavy stones should not be placed on wall until the course below has hardened enough to support them.
23. Use above procedures throughout the wall until completed.
24. Use a mason line to keep wall straight.
25. Protect the masonry from rain and masonry droppings at all times.
26. When wall is finished, clean the wall.
27. Wall should be cleaned with a stiff fiber brush and clean water.
29. Do not use acid compound to clean a stone wall; it will discolor it.
30. Water proofing can be used.

31. Use vinyl lacquer or nonstain asphalt emulsion.
32. Have instructor check work.
33. Replace tools and materials.
34. Clean work area.

STUDENT INFORMATION SHEET

MASONRY

UNIT: Basic Information for Bricklaying/Stonemasonry

TOPIC: Cleaning Stonework

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(2)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to mix mortar, build a stone wall, and clean stonework correctly.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to clean stonework correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used with the basic information for bricklaying/stonemasonry will include mathematics, oral and written communications, and the application of reading concepts and skills.*

CLEANING STONEWORK

Stonework should be cleaned with a stiff fiber brush and clean water. If stains are difficult to remove, use soapy water and then rinse with clear water. If stonework is kept clean by sponging during construction, the final cleaning will be easy.

Machine-cleaning process should be approved by the supplier before using. Acids, wire brushes, and sandblasting are usually not permitted on stonework. Strong acid compounds used for cleaning brick will burn and discolor many types of stone.

When working with stone, cover the wall at the end of each day with plastic or canvas to protect it from the weather.

If a spot of mortar is hard to remove, use a solution of muriatic acid mixed with water in a proportion of 1 part acid to 10 parts water. Then, quickly rinse thoroughly with cold, clear water.

ASSIGNMENT SHEET

MASONRY

NAME: ______________________________ **DATE:** ____________________

UNIT: Basic Information for Bricklaying/Stonemasonry

TOPIC: Cleaning Stonework

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(2)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to mix mortar, build a stone wall, and clean stonework correctly.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will be able to clean stonework correctly.

REFERENCE:
III-3-C-IS
B.T. I-Unit IV

DIRECTIONS: Read and answer the following questions in the space provided.

1. What is used to clean stonework?

2. What should be used if stains are difficult to remove?

3. What process requires the supplier's approval before you use it?

4. What will burn and discolor many types of stone?

5. What is not permitted to be used on stonework?

6. What would make stone cleaning easier during construction?

7. What should be done at the end of each workday?

8. If muriatic acid is used, what proportions should be used?

9. A mason contracts a job for $700.00. Labor cost was $316.00 and material cost $203.00. Other expenses totaled $78.00. How much profit was made on the job?

10. How many cubic yards of concrete will it take to pour a sidewalk 6 feet wide, 118 feet long, and 4 inches thick?

STUDENT INFORMATION SHEET

MASONRY

UNIT: Construction Processes

TOPIC: Foundation Walls

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(2)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct foundation, damp-proof, and cavity walls and repair wall cracks correctly.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to construct foundation walls correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used with construction processes will include mathematics, application of reading concepts and skills, and written communications.*

FOUNDATION WALLS

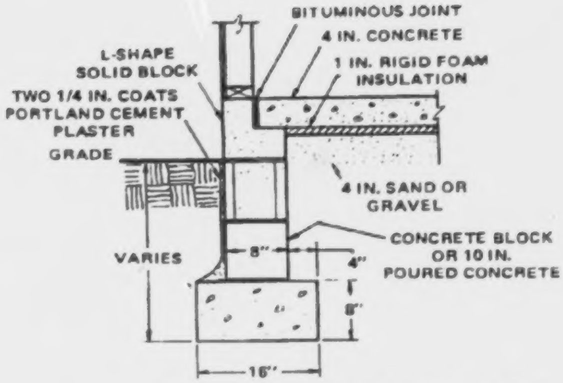
The foundation walls, like footings, are load-transferring elements. They must be able to:

1. Support the weight of the building above.
2. Resist pressures from the ground.
3. Provide anchorage for the building superstructure.

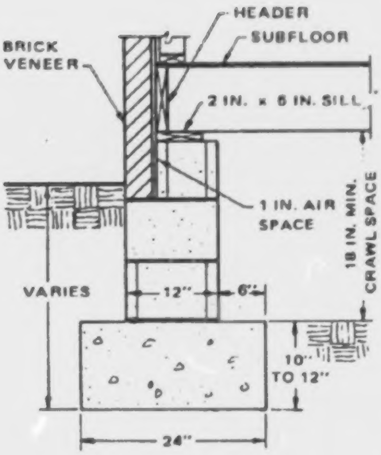
They must also be durable and resist moisture penetration. Foundation walls of hollow concrete block should be capped with a course of solid masonry to help distribute the loads from floor beams and to serve as a termite barrier.

The most common type is a *T foundation*. The name comes from the shape of the foundation and the footings, which look like an inverted T. The footing and foundation wall, in this case, are generally two separate parts, but may be cast as a single unit. (See TM-2.)

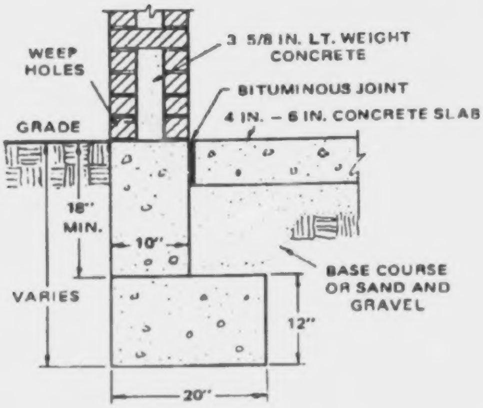
Polyethylene sheeting is often applied to foundation walls that have been poured. This serves as waterproofing material. If the soil does not drain well, it may be necessary to install drain tiles around the foundation to help take water away from the area. This pipe is laid on a slope of about 1" per 20′ and spaced about 1/4 inch apart. Wrap tarpaper around the joints; then cover with 6" to 8" of coarse gravel.


BITUMINOUS JOINT
4 IN. CONCRETE
L-SHAPE SOLID BLOCK
1 IN. RIGID FOAM INSULATION
TWO 1/4 IN. COATS PORTLAND CEMENT PLASTER
GRADE
4 IN. SAND OR GRAVEL
CONCRETE BLOCK OR 10 IN. POURED CONCRETE
VARIES
8"
4"
8"
16"

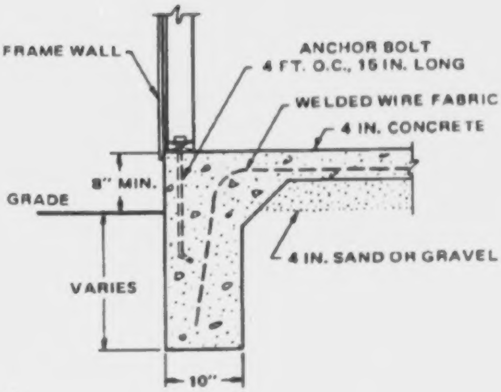
8-inch foundation wall with insulated slab floor


HEADER
SUBFLOOR
BRICK VENEER
2 IN. x 6 IN. SILL
1 IN. AIR SPACE
18 IN. MIN. CRAWL SPACE
VARIES
12"
6"
10" TO 12"
24"

12-inch concrete block foundation for brick veneer on frame


3 5/8 IN. LT. WEIGHT CONCRETE
WEEP HOLES
BITUMINOUS JOINT
4 IN. – 6 IN. CONCRETE SLAB
GRADE
18" MIN.
10"
BASE COURSE OR SAND AND GRAVEL
VARIES
12"
20"

Foundation for 10-inch masonry bonded wall with slab floor


FRAME WALL
ANCHOR BOLT 4 FT. O.C., 15 IN. LONG
WELDED WIRE FABRIC
4 IN. CONCRETE
8" MIN.
GRADE
4 IN. SAND OR GRAVEL
VARIES
10"

Thickened edge slab foundation for frame wall construction

ASSIGNMENT SHEET

MASONRY

NAME: ____________________ DATE: ____________

UNIT:	Construction Processes
TOPIC:	Foundation Walls
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(D) (a)(7)(E) (e)(2)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct foundation, damp-proof, and cavity walls and repair wall cracks correctly.
SPECIFIC OBJECTIVE(S):	After completing this assignment sheet, the student(s) will be able to construct foundation walls correctly.
REFERENCE:	III-4-A-IS B.T. I-Unit IV
DIRECTIONS:	Read and answer the following questions in the space provided.

1. What three load-transferring qualities must be present in foundation walls?

2. The hollow foundation wall must be capped with what, and why?

3. Draw two different foundation walls using TM-2.

4. What is the most common type of foundation wall?

5. What can be used as a termite barrier?

6. What can be used to waterproof foundation walls that are poured?

7. A contractor built 26 houses. The project required 25,350 square feet of concrete. How much concrete was required per house, on average?

8. If a concrete mason can install an average of 170 square feet of topping per hour, how many square feet can he install in 48 hours?

9. Use a mixture of 1 part cement, 1 part gravel, and 3 parts sand to make 25 cubic feet of topping. How many cubic feet of each are needed?

   Cement ____cubic feet
   Gravel ____ cubic feet
   Sand _____ cubic feet

10. Figure the amount of time worked in 4 weeks by 12 masons who worked for 30 hours each week.

JOB SHEET

MASONRY

NAME: ________________________ DATE: ______________

UNIT: Construction Processes

NAME OF JOB: Forms for Concrete Walls

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(2)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct foundation, damp-proof and cavity walls and repair wall cracks correctly.

SPECIFIC OBJECTIVE(S): Upon completing this lesson, the student(s) will be able to construct and set sill bolts in concrete correctly.

TOOLS AND EQUIPMENT: Skill saw, hammer, speed square, framing square, 25 foot steel tape, carpenter's pencil

MATERIALS: 4- 8′ studs, sheet of plywood, oil, filler for holes

GENERAL INSTRUCTIONS: This activity can be used as a simulated work task in any building trades program. Student(s) can apply skills aquired in completing specified job tasks at a job site. Instructor furnishes print or dimensions to be used. Use proper safety precautions.

PROCEDURES AND/OR TASKS:

1. Using plywood filler, fill dents, seal edges, and coat plywood with oil.
2. Cut bottom plate to length: for standard low form, the length is 8 foot.

3. Cut studs to length for a low form without top plate, 3′ 10 1/2". If you use a top plate, cut off another 1 1/2 inches.

4. On the bottom plate, mark the location of studs.

5. Nail studs to bottom plate as marked.

6. Lay plywood smooth side up on studs and plate, making sheet flush with the bottom plate and one side stud.

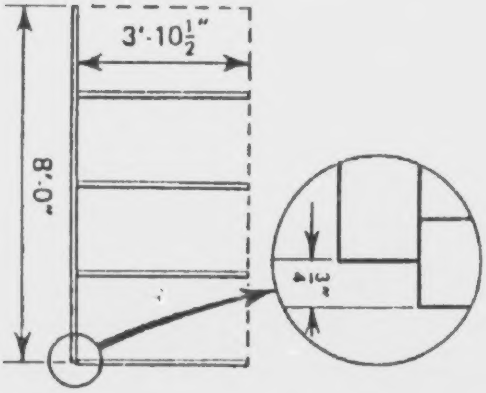
7. Nail through the plywood into the plate and side stud. Use as few nails as possible.

8. Position loose studs in correct position and nail each end in place.

9. Drill small holes in outside studs for locking devices.

10. Mark the location of holes for ties.

11. Have instructor check work.



STUDENT INFORMATION SHEET
MASONRY

UNIT: Construction Processes

TOPIC: Damp-proofing Walls

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(2)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct foundation, damp-proof, and cavity walls and repair wall cracks correctly.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to construct damp-proof walls correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used with construction processes will include mathematics, application of reading concepts and skills, and written communications.*

DAMP-PROOF WALLS

The outside of masonry walls should be parged with a 1/2-inch thick coat of Portland cement, plaster, or mortar. It should be applied in two coats, each 1/4-inch thick. The wall surface should be clean and damp, but not soaked, before applying the plaster. The first coat should be troweled firmly over the wall. When this coat is partially hardened, it should be roughened with a scratcher. This provides a good bond for the next coat. Keep the first coat moist and allow it to harden for a minimum of 24 hours before applying the second coat. Cover the wall from the footing to six inches above the finish grade line. Form a cove over the footing to prevent water from collecting at this point. The second coat should be moist-cured for at least 48 hours.

Some areas of the country or soil conditions require additional damp-proofing. A heavy coat of tar, two coats of a cement-based paint, or a covering of thin plastic film may be used. This is in addition to the parge coat.

WATERPROOFING JOINTS

The process of waterproofing masonry joints can be done by using a grout coating. A typical grout coating is made up of 3/4 part Portland cement, 1 part sand that will pass a No. 30 sieve, and 1/4 part fine lime. Before using, mix all ingredients with water to obtain fluid consistency. Always apply water to joints that are to be grouted so that the masonry will absorb moisture. Brush the grout into the joints. Two coats should be applied for a good seal.

ASSIGNMENT SHEET

MASONRY

NAME: ______________________________ **DATE:** ____________________

UNIT: Construction Processes

TOPIC: Damp-proofing Walls

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(2)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct foundation, damp-proof, and cavity walls and repair wall cracks correctly.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will be able to construct damp-proof walls correctly.

REFERENCE:
III-4-B-IS
B.T. I-Unit IV

DIRECTIONS: Read and answer each of the following questions in the space provided.

1. How should the wall be initially prepared?

2. How long should the first coat dry?

3. What should be done to keep water from collecting at a footing?

4. If additional damp-proofing is required for certain soil types, what needs to be done?

5. How long should the second coat be moist-cured?

6. Some soil conditions require what to be applied in addition to the parge coat?

7. What is used to waterproof joints?

8. What is the grout formula to mix in order to waterproof joints?

9. What should be done before applying grout to the joint?

10. How many coats of grout should be applied for a good seal?

/

JOB SHEET
MASONRY

NAME: ______________________ DATE: ______________

UNIT:	Construction Processes
NAME OF JOB:	Construct a Simple Block Wall and Waterproof
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(2)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct foundation, damp-proof, and cavity walls and repair wall cracks correctly .
SPECIFIC OBJECTIVE(S):	Upon completing this lesson, the student(s) will be able to construct a simple block wall and waterproof a wall correctly .
TOOLS AND EQUIPMENT:	Practice board (1" x 12" x 6'), chalkline, mortar stand, shovel, mason's level, trowel, S-shaped joint raker, mop
MATERIALS:	Four concrete blocks (one corner block and three stretcher blocks), bituminous primer, coldtar, portland cement, hydrated lime, sand, water
GENERAL INSTRUCTIONS:	This activity can be used as a simulated work task in any building trades program. Student(s) can apply skills aquired in completing specified job tasks at a job site. Instructor should provide dimensions or print to be used. Use proper safety precautions.

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PROCEDURES AND/OR TASKS:

1. Establish outside wall line. You may use the chalk line in order to provide a straight line for the blocks. On your practice board, mark the outside wall line 1 1/2 inches from the edge of the board.

2. Lay out the first course of blocks without mortar to check layout, allowing 3/8 inch for each mortar joint. You may wish to mark the position of each block. When satisfied with the layout, move blocks aside.

3. Follow the same steps for mixing type N mortar, 1:1:6, one part portland cement, one part lime, and six parts sand.

4. Spread a full bed of mortar on the practice board (the width of each block).

5. Use the trowel to furrow the mortar (Figure 1).

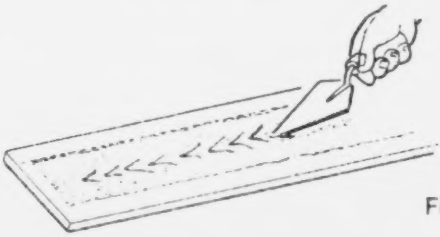


Figure 1.

6. Place the corner block in place.

7. Use the trowel to place mortar on the end of the block. This is called buttering. Stand three stretcher blocks on end, and butter the end of the face shell (Figure 2).

Buttering end of stretcher

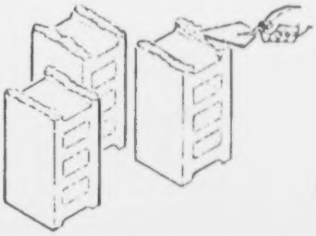


Figure 2.

8. Lay each block along the wall on the practice board. To place the blocks, push them downward into the mortar bed and sideways against the previously laid block (Figure 3).

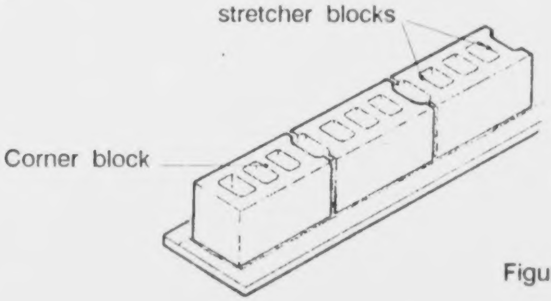
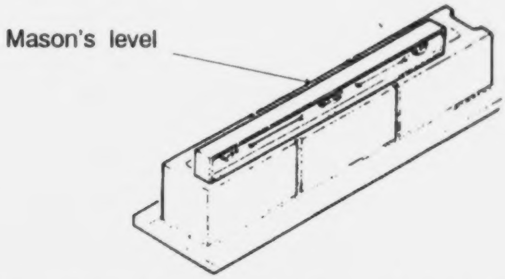


Figure 3.

9. After you have laid four blocks, use a mason's level to align, level, and plumb them. (**Note:** Be sure to tap on the block and not the level).



10. When mortar is thumbprint hard, use S-shaped jointer to tool the vertical mortar joints.
11. Let work dry.
12. Use bituminous primer on blocks.
13. This can be mopped on the block surface.
14. Apply building felt to surface and repeat steps 12 through 14 until two to six layers of felt are applied.
15. The number of layers depends on amount of water on wall.
16. Apply a final coat to seal the layers.
17. Have instructor check work.
18. Replace tools and material.
19. Clean work area.

STUDENT INFORMATION SHEET

MASONRY

UNIT: Construction Processes

TOPIC: Cavity Walls

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(2)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct foundation, damp-proof, and cavity walls and repair wall cracks correctly.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to construct cavity walls correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used with construction processes will include mathematics, application of reading concepts and skills, and written communications.*

CAVITY WALL

A cavity wall is built of masonry units arranged to provide a continuous air space that is two to three inches wide (TM-3). The facing and back wythes, or tiers, are connected with ridged metal ties. The exterior wythe is usually a nominal four inches thick. The interior wythe may be four, six, or eight inches, depending on the load to be supported, and the height and length of the wall. When a cavity of a nominal two inches is maintained, the overall thickness will be 10, 12, or 14 inches.

The cavity provides two advantages:

1. Air space in itself has insulation value, or the space may be filled with insulation material for added reduction of heat transfer.
2. It acts as a barrier to moisture.

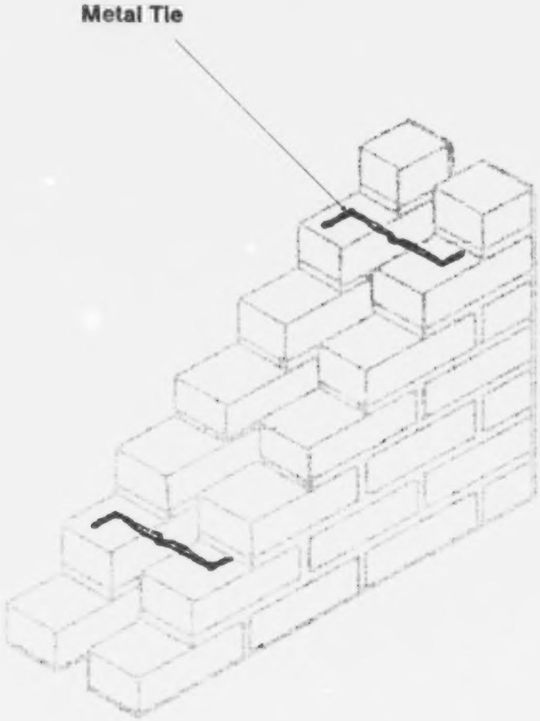
However, to be effective, the cavity must be kept free of mortar droppings during construction. When weep holes are required at the bottom of a cavity wall, flashing should be used. This keeps any moisture which might collect in the cavity away from the inner wall.

DAMP-PROOFING CAVITY WALLS

Silicones are considered waterproof material, but they will actually only damp-proof a wall. Masonry silicones are clear liquids.

There are two types of silicones used for masonry: water-based and solvent-based. These can be applied by spraying or brushing. The solvent type will penetrate masonry better due to a smaller molecular structure. This type of damp-proofing usually will not change coloring. Silicones usually will penetrate 1/8" to 1/4" in depth. Silicones do not seal the pores; however, water can evaporate through the wall face to the outside.

The wall is resistant to water penetration from the outside. This is known as "letting the wall breathe," which is desirable for a masonry wall.



TM-3

ASSIGNMENT SHEET
MASONRY

NAME: ______________________ DATE: ______________

UNIT:	Construction Processes
TOPIC:	Cavity Walls
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(2)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct foundation, damp-proof, and cavity walls and repair wall cracks correctly.
SPECIFIC OBJECTIVE(S):	After completing this assignment sheet, the student(s) will be able to construct cavity walls correctly.
REFERENCE:	III-4-C-IS B.T.I--Unit IV
DIRECTIONS:	Read and answer each of the following questions in the space provided.

1. What feature is provided by the arrangement of masonry units in a cavity wall?

2. What two advantages does the cavity provide?

3. When weep holes are required at the bottom of a cavity wall, what should be used?

4. Why should mortar droppings be kept out of cavity walls?

5. How are the facing and back wythes, or tiers, connected?

6. Why are weep holes at the bottom of the wall?

7. How can silicones be applied to masonry walls?

8. What two types of silicones are used to damp-proof masonry walls?

9. Which type of silicone will best penetrate the masonry wall?

10. What depth will the silicone penetrate a masonry wall?

JOB SHEET

MASONRY

NAME: ________________________ **DATE:** ______________

UNIT: Construction Processes

NAME OF JOB: Draw Cavity Wall Detail

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(2)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct foundation, damp-proof, and cavity walls and repair wall cracks correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to draw cavity wall detail correctly.

TOOLS AND EQUIPMENT: pencil, fractional rule

MATERIALS: 8 1/2" x 11" paper; cavity wall sketch in back of the student manual.

GENERAL INSTRUCTIONS: Draw cavity wall sketch so 1" equals 1′ 0"; this will help student(s) to understand use of foundation walls.

PROCEDURES AND/OR TASKS:

1. Collect materials needed to complete this task.
2. Draw sketch so 1" equal 1′ 0".

3. Label all dimensions and parts.
4. Write summary of why foundation wall is capped with masonry.
5. When complete, present to instructor.

STUDENT INFORMATION SHEET

MASONRY

UNIT: Construction Processes

TOPIC: Repairing Wall Cracks

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(2)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct foundation, damp-proof, and cavity walls and repair wall cracks correctly.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to repair cracks in brick and stone walls correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used with construction processes will include mathematics, application of reading concepts and skills, and written communications.*

REPAIRING CRACKS

The main factors in determining if a masonry wall will function properly are: the materials used, the design using the materials, the construction methods used in carrying out the design, and the ability of the wall to keep out moisture. The type and size of the crack usually indicate the cause. You should wait at least one year after the crack appears before making repairs.

SETTLEMENT CRACKS

Settlement cracks are more evident in small buildings such as residences. They usually occur when the footing or part of the foundation settles unevenly with another part of the structure. These cracks are usually caused by different load-bearing strengths of soils under the structure.

To repair a settlement crack, cut out the affected area after the structure has stopped settling and fill in with mortar. The settlement cracks usually run in a vertical position.

EXPANSION CRACKS

Expansion cracks are caused by contraction and expansion of the masonry wall. The masonry joints have opened up and appear as a step-type crack on the brick wall. When walls are constructed, expansion joints should be built into the walls to relieve the pressure.

To repair the area affected, the mortar should be removed at least 3/4 inch. The cracks should be brushed out and cleaned to remove all the dust. Wet the area with a small brush and some water. Then, use Portland cement mortar, such as Type N (1:1:6), which should be pre-hydrated and packed into the crack.

There are types of joint or elastic compounds, such as caulking compound, that can be used to fill cracks in masonry or concrete. The sealant is available in different colors to match the concrete or masonry being patched.

Vertical cracks are common in offset and setback walls. When one or more walls expands toward an offset, the movement produces bending in the offset and causes vertical cracks in the masonry.

FOUNDATION WALL CRACKS

This is a common type of crack that occurs in foundation walls in a horizontal position and is usually caused by the earth being pushed in and around the foundation. This could be prevented by bracing the inside of the foundation or waiting until the structure is built and then doing the backfill around the foundation.

This type of crack is expensive to repair. The only way to repair this is to remove the earth from around the cracked area and re-lay the concrete with fresh mortar.

ASSIGNMENT SHEET
MASONRY

NAME: ______________________________ **DATE:** ____________________

UNIT: Construction Processes

TOPIC: Repairing Wall Cracks

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(2)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct foundation, damp-proof, and cavity walls and repair wall cracks in brick and stone walls correctly.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will be able to repair wall cracks in brick and stone walls correctly.

REFERENCE: III-4-D-IS

DIRECTIONS: Circle the correct letter and fill in the blank with the proper term.

1. A(n) __________________ usually shows up in a step-type crack.

   A. curling of concrete
   B. offset
   C. expansion
   D. settlement

2. The ________________ is an elastic filler used on an exposed wall.

   A. oakum
   B. tar compound
   C. caulking compound
   D. paint

3. One of the most common cracks is ______________, caused by expansion and contraction of the wall.

A. settlement
B. corner
C. offset
D. expansion

4. Masonry wall cracks should not be repaired for at least ______________.

A. 4 months
B. 12 months
C. 7 months
D. 9 months

5. Settlement cracks usually run in a ______________ position.

A. horizontal
B. parallel
C. vertical
D. straight line

6. The load-bearing strength of soil under structures may cause the ____________ type of cracks.

A. expansion
B. settlement
C. horizontal
D. vertical

III-4-D-JS-1

JOB SHEET

MASONRY

NAME: ______________________________ **DATE:** ________________

UNIT: Construction Processes

NAME OF JOB: Repairing Wall Cracks

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(2)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct foundation, damp-proof, and cavity walls and repair wall cracks correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to repair cracks in brick and stone walls correctly.

TOOLS AND EQUIPMENT: caulk gun; small, steel brush; whisk broom

MATERIALS: elastic or joint compound sealant

GENERAL INSTRUCTIONS: After the crack has stopped moving, it can be repaired using elastic-type filler; this will let the crack move and will keep it sealed off.

PROCEDURES AND/OR TASKS:

1. Collect materials needed to complete this task.
2. Use steel brush to clean out crack and remove any loose material.
3. Use whisk broom to brush out and clean the crack.

4. Install tube of sealer in caulk gun, trim tip off tube, puncture seal inside spout.
5. Fill crack with sealant.
6. Wipe away any excess sealant.
7. Clean tools and put them away.
8. Have instructor check work in progress.

STUDENT INFORMATION SHEET

MASONRY

UNIT: Blueprints and Working Drawings

TOPIC: Blueprint Reading

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(2)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to read and interpret blueprints correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used when reading blueprints and working drawings will include mathematical principles, oral and written communication skills, and the application of reading concepts and skills.*

BLUEPRINT READING

Construction drawings describe the size, shape, location, and specifications of the elements of a structure. They are frequently called *working drawings*, *blueprints*, or *plans*. The drawings are standard symbols and notes which are recognized by tradespeople in the construction field. Masons must know the meaning of the lines, symbols, abbreviations, and notes shown. Learning to read plans is essentially learning a new language.

LINE SYMBOLS

Border Lines--very heavy lines used to form a boundary for the drawing.

Object Lines--heavy lines which show the outlines of the visible features of an object.

Hidden Lines--represent an edge or intersection of two surfaces which are not visible in a given way.

Center Lines--thin lines which indicate the center of symmetrical objects.

Extension Lines--thin lines used to show where a dimension line ends.

Dimension Lines--are thin lines used to show size or location of a feature of the structure.

Long Break Lines--thin lines used to indicate that all of the part is not shown.

Short Break Lines--heavy lines used when part of the object is shown broken away to reveal a hidden feature.

Cutting Plan Lines--heavy lines used to indicate where the object has been sectioned to show internal features.

Section Lines or **Crosshatch Lines**--very thin lines used to show the feature has been sectioned.

Guide Lines--very light, thin lines used in lettering.

Construction Lines--also very light, thin lines used by the drafter in the making of a drawing.

Some of these lines are shown in TM-4.

SYMBOLS AND ABBREVIATIONS

The purpose of symbols and abbreviations is to conserve space. Some symbols look very much like the feature in reality, others do not.

The symbols shown in TM-5 will show:

Building materials

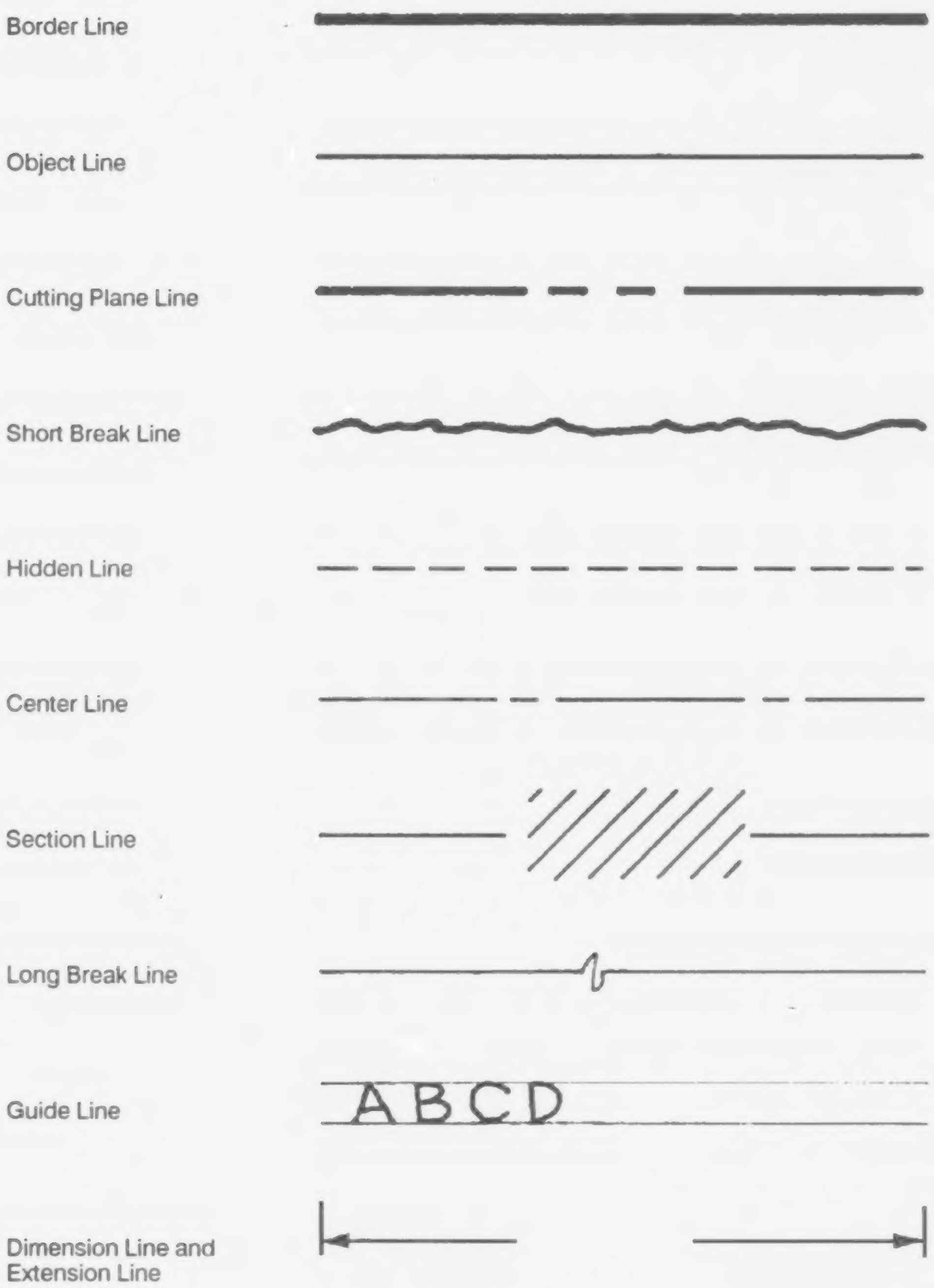
Topographical symbols

Plumbing symbols

Climate control symbols

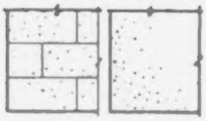
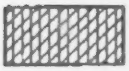
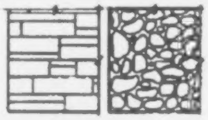
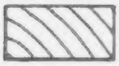
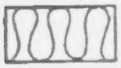
Electrical symbols

Some symbols are used to represent several different materials or conditions. Care must be taken when reading them.

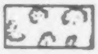
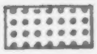
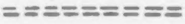
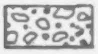

Border Line
Object Line
Cutting Plane Line
Short Break Line
Hidden Line
Center Line
Section Line
Long Break Line
Guide Line
ABCD
Dimension Line and Extension Line

TM-4

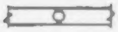
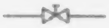
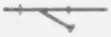
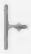
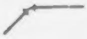
BUILDING MATERIALS

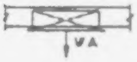
TOPOGRAPHICAL SYMBOLS

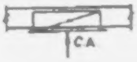





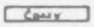
PLUMBING SYMBOLS

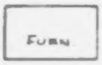






CLIMATE CONTROL SYMBOLS



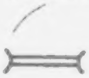


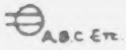




ELECTRICAL SYMBOLS

S_3





TM-5

ASSIGNMENT SHEET

MASONRY

NAME: ______________________________ DATE: ____________________

UNIT:	Blueprints and Working Drawings
TOPIC:	Blueprint Reading
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(2)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.
SPECIFIC OBJECTIVE(S):	After completing this assignment sheet, the student(s) will be able to read and interpret blueprints correctly.
REFERENCE:	III-5-A-IS B.T.I--Unit IV
DIRECTIONS:	Read and answer each of the following questions in the space provided.

1. What do construction drawings describe?

2. To understand and read blueprints, what must you know?

3. Using TM-5, select one symbol from each group. Draw the symbol and label it *building materials*, *topographical*, *plumbing*, *climate*, or *electrical*.

4. What do hidden lines represent?

5. Extension lines are thin and are used to show what?

6. How are long break lines used?

7. Explain how section lines are used.

8. How are guide lines used?

9. The drafter uses construction lines to do what?

10. What is used to conserve space on a blueprint?

JOB SHEET

MASONRY

NAME: ______________________________ **DATE:** ____________________

UNIT: Blueprints and Working Drawings

NAME OF JOB: Reading Blueprints and Working Drawings

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(2)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to read and interpret blueprints correctly.

TOOLS AND EQUIPMENT: Tape measure, 12-inch ruler, pencil

MATERIALS: Set of blueprints (provided by instructor), paper

GENERAL INSTRUCTIONS: This activity can be used as a simulated work task in any building trades program. Students can apply skills aquired in completing specified job task at a job site. Follow instructions given in class and complete task.

PROCEDURES AND/OR TASKS:

1. Find the plot plan or plot sheet and locate the symbol indicating north. On a sheet of paper, appropriately indicate the direction each side of the building faces.
2. Using the complete floor plan, compute the total square footage of the residence. Calculate the footage of the garage or carport area and the patio or porch space.

3. Study the symbol sheet that is furnished. Look at the floor plan again. Identify and count all electrical outlets, switches, and light fixtures.
4. Use the window and door schedule with the floor plan. Locate each window and door, and for location of each door, note door size.
5. On the floor plan sheet, locate the kitchen, den, and utility room. With a tape measure or ruler, use the scale 1" = 4′ or 1/4" = 1′, and record how many linear feet of cabinet space there is.
6. Find the roof pitch. Record what sheet you found it on, and what it is.
7. Using the floor plan: What is the typical thickness of a wood, inside wall? A brick and wood, outside wall?
8. Record the dimensions (in feet and inches) of the front door (1) the right corner, (2) the left corner.
9. Record the total outside dimension of the building.
10. Look at the complete set of blueprints and find the scale used on (1) the floor plan, (2) the wall section, (3) the plot plan, and (4) the details or sections.
11. Using the information you found in problem number 2, calculate the total living area.
12. Using the floor plan, record the total footage of the carport or garage.
13. What are the sizes of the windows or masonry openings to be used in this residence?
14. Using a structural plan, record what size reinforcement bar is called for in the footings.
15. Record where flashing will be installed.
16. Record what type lintels are required over windows located in outside walls.
17. Record how much slope is on the slab for the rear porch or patio.
18. Locate and record what size sills should be used.
19. Submit job sheet to instructor.
20. Replace tools and materials used.

STUDENT INFORMATION SHEET
MASONRY

UNIT: Blueprints and Working Drawings

TOPIC: Scale and Dimensions

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(2)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.

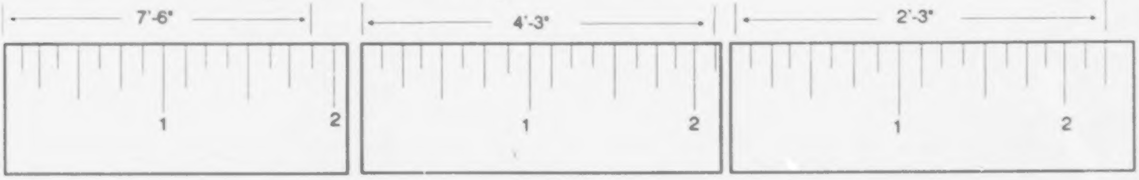
SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to read and interpret blueprint scales and dimensions correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used when reading blueprints and working drawings will include mathematical principles, oral and written communication skills, and the application of reading concepts and skills.*

SCALES AND DIMENSIONS

Most drawings are drawn to a particular scale. Residential floor plans, elevations, foundation plans, etc., are generally drawn to 1/4"=1′ 0" scale. This means that every 1/4 inch on the drawing is equal to 1 foot on the house. Details are drawn at a larger scale, such as 1/2"=1′ 0" or 1"=1′ 0". Do not be confused by the terms *size* and *scale*. *Size* means inches to inches (1/4" to 1", or quarter size). *Scale* means inches to feet (1/4" to 1′ 0", or quarter scale).

How to use a folding rule to scale a plan



III-5-B-AS

ASSIGNMENT SHEET

MASONRY

NAME: ________________________________ **DATE:** ____________________

UNIT:	Blueprints and Working Drawings
TOPIC:	Scale and Dimensions
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(2)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.
SPECIFIC OBJECTIVE(S):	After completing this assignment sheet, the student(s) will be able to read and interpret blueprint scales and dimensions correctly.
REFERENCE:	III-5-B-IS B.T.I--Unit IV
DIRECTIONS:	Read and answer each of the following questions in the space provided.

1. The residential floor plans are drawn to what scale?

2. What does the term *size* mean?

3. What does the term *scale* mean?

4. Every 1/4 inch on the drawing is equal to what?

5. Using the 1/4" = 1′ 0" scale, 7′ 6" would read ________________ on a folding rule to scale a plan.

A. 2 1/8"
B. 1 1/4"
C. 1 5/8"
D. 1 7/8"

JOB SHEET
MASONRY

NAME: ______________________________ **DATE:** __________________

UNIT: Blueprints and Working Drawings

NAME OF JOB: Drawing Details

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(2)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to read and interpret blueprint scales and dimensions correctly.

TOOLS AND EQUIPMENT: sharp pencil, fractional rule

MATERIALS: 11 1/2" x 20" paper; foundation plan sheet from back of the student manual.

GENERAL INSTRUCTIONS: Draw section A.A. and pier detail to 1"=1' 0" scale. This will help student(s) to understand the need to scale a blueprint and understand the parts of a foundation plan.

PROCEDURES AND/OR TASKS:

1. Collect materials needed to complete task.

2. Draw details to scale 1"=1' 0".

3. Measure and mark each line and dimension shown.

4. Check to be sure all dimensions and marks are clear and correct.

5. When complete, give to instructor to evaluate.

STUDENT INFORMATION SHEET
MASONRY

UNIT: Blueprints and Working Drawings

TOPIC: Specifications

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(2)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to read and interpret drawing specifications correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used when reading blueprints and working drawings will include mathematical principles, oral and written communication skills, and the application of reading concepts and skills.*

SPECIFICATIONS

Each set of drawings is ordinarily accompanied by a set of written specifications, "specs."

Specifications are the written description of the construction project prepared by the architect and/or engineer. The specifications, together with the working drawings, become the construction document upon which an agreement is made between all parties concerned in the project.

Should a discrepancy occur between the specifications and the drawings, the specs usually are accepted and take precedence over the drawings.

Specifications are generally divided into two major sections:

1. **General Conditions**

2. **Technical Sections**

The *General Conditions* deal with terms of agreement, insurance, responsibility for permits, supervision, payment for the work, and temporary utilities.

The *Technical Sections* deal with the actual building of the structure and the trade work involved.

In order to know what to do on the job, a mason must learn to understand the floor plans, elevations, details and sections of the blueprints. Information on the blueprints or working drawings have the same information as the specifications. These documents are binding to all parties, including the subcontractors. The specifications will usually state colors to be used, materials, where to acquire equipment, and other requirements to complete the project.

The specifications and blueprints are the primary way that the contractor communicates with the architect who drew the blueprints.

ASSIGNMENT SHEET

MASONRY

NAME: ______________________________ DATE: ____________________

UNIT:	Blueprints and Working Drawings
TOPIC:	Specifications
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(2)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.
SPECIFIC OBJECTIVE(S):	After completing this assignment sheet, the student(s) will be able to read and interpret drawing specifications correctly.
REFERENCE:	III-5-C-IS B.T.I--Unit IV
DIRECTIONS:	Read and answer each of the following questions in the space provided.

1. What is another name for specifications?

2. What are the drawings called that all parties concerned in the project use?

3. What are the two major sections of the specifications?

4. Explain what the general conditions concern.

5. What section of a blueprint involves the trade work and actual building of the structure?

JOB SHEET

MASONRY

NAME: ____________________ **DATE:** ____________

UNIT: Blueprints and Working Drawings

NAME OF JOB: Interpret Specifications

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(2)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to read and interpret drawing specifications correctly.

TOOLS AND EQUIPMENT: Ruler, pencil

MATERIALS: Set of blueprints or working drawings supplied by instructor, paper

GENERAL INSTRUCTIONS: Follow instructions given in class, and complete the procedures listed below.

PROCEDURES AND/OR TASKS:

1. Find specifications on plans.
2. Record information found in section A on notice to sub-bidders.
3. Locate where form for sub-bidders is, and record what form is to contain.
4. Record and itemize what is in the general conditions.

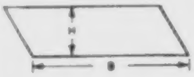
5. Using section for masonry work, record mortar materials to be used.
6. Record special mortar mixing procedures to be done.
7. List type of brick to be used, and cost per M of brick.
8. Locate and list type of flashing to be used.
9. List any specifications about reinforcing in block walls and partitions.
10. List specifications needed for anchors and wall ties.
11. List specifications for handling brick.
12. List specifications for cutting and patching.
13. List specifications on painting and cleaning down.
14. List specifications on any iron work to be completed.
15. List specifications for removal and alteration of work.
16. List specifications of fire protection.
17. List specifications for any general protection needed for project.
18. List specifications for any clarifications that need to be made to complete the project.
19. Submit job sheet to instructor.

APPENDIX III-A

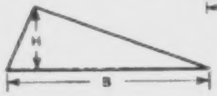
MASONRY
FORMULAS FOR AREA AND VOLUME OF GEOMETRIC SHAPES

AREAS:

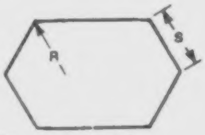
Parallelogram: $A = B \times H$



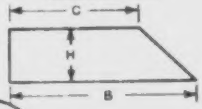
Triangle: $A = \frac{B \times H}{2}$



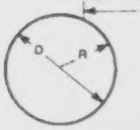
Polygon: $A = \frac{\text{Sum of sides (S)}}{2} \times R$



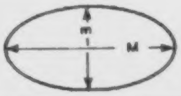
Trapezoid: $A = \frac{B+C}{2} \times H$



Circle: $A = \pi r^2$
$A = .7854 \times D^2$
$A = .0796 \times C^2$

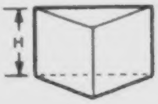


Ellipse: $A = M \times m \times .7854$

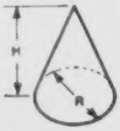


VOLUME:

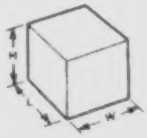
Prisms: $V = \text{Area of end} \times H$



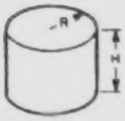
Cone: $V = \frac{\pi r^2 \times H}{3}$



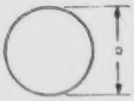
Rectangular: $V = L \times W \times H$



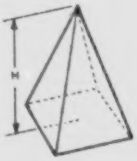
Cylinder: $V = \pi r^2 \times H$



Sphere: $V = 1/6 \times \pi D^3$



Pyramids: $V = \text{Area or Base} \times \frac{H}{3}$



ENGLISH TO METRIC CONVERSION

LENGTHS

1 INCH = 2.540 CENTIMETRES
1 FOOT = 30.48 CENTIMETRES
1 YARD = 91.44 CENTIMETRES OR 0.9144 METRES
1 MILE = 1.609 KILOMETRES

AREAS

1 SQ. IN. = 6.452 SQ. CENTIMETRES
1 SQ. FT. = 929.0 SQ. CENTIMETRES OR 0.0929 SQ. METRE
1 SQ. YD. = 0.8361 SQ. METRE

VOLUMES

1 CU. IN. = 16.39 CU. CENTIMETRES
1 CU. FT. = 0.02832 CU. METRE
1 CU. YD. = 0.7646 CU. METRE

WEIGHTS

1 OUNCE (AVDP) = 28.35 GRAMS
1 POUND = 453.6 GRAMS OR 0.4536 KILOGRAM
1 (SHORT) TON = 907.2 KILOGRAMS

LIQUID MEASUREMENTS

1 (FLUID) OUNCE = 0.02957 LITRE OR 28.35 GRAMS
1 PINT = 473.2 CU CENTIMETRES
1 QUART = 0.9463 LITRE
1 (US) GALLON = 3785 CU. CENTIMETRES OR 3.785 LITRES

POWER MEASUREMENTS

1 HORSEPOWER = 0.7457 KILOWATT

TEMPERATURE MEASUREMENTS

TO CONVERT DEGREES FAHRENHEIT TO DEGREES CENTIGRADE, USE THE FOLLOWING FORMULA:

$$C=5/9 \times (F-32)$$

METRIC TO ENGLISH CONVERSION

LENGTHS

1 MILLIMETRE (mm) = 0.03937 IN.
1 CENTIMETRE (cm) = 0.3937 IN.
1 METRE (m) = 3.281 FT. OR 1.0937 YD.
1 KILOMETRE (km) = 0.6214 MILES

AREAS

1 SQ. MILLIMETRE = 0.00155 SQ. IN.
1 SQ. CENTIMETRE = 0.155 SQ. IN.
1 SQ. METRE = 10.76 SQ. FT. OR = 1.196 SQ. YD.

VOLUMES

1 CU. CENTIMETRE = 0.06102 CU. IN.
1 CU. METRE = 35.31 CU. FT. OR = 1.308 CU. YD.

WEIGHTS

1 GRAM (G) = 0.03527 OZ.
1 KILOGRAM (kg) = 2.205 LB.
1 METRIC TON = 2205 LB.

LIQUID MEASUREMENTS

1 CU. CENTIMETRE (cm^3) = 0.06102 CU. IN. OR 1.057 QUARTS
1 LITRE (1000 cm^3) = 2.113 PINTS OR 61.02 CU. IN.

POWER MEASUREMENTS

1 KILOWATT (kw) = 1.341 HORSEPOWER (hp)

TEMPERATURE MEASUREMENTS

TO CONVERT DEGREES CENTIGRADE TO DEGREES FAHRENHEIT, USE THE FOLLOWING FORMULA:

$$F = (9/5 \times C) + 32$$

FORMULA FOR GROUT

3/4 part Portland cement, 1 part sand that will pass No. 30 sieve, and 1/4 part fine lime.

Mix for general stonework is Type N mortar in the proportions of 1 part Portland cement to 1 part hydrated lime to 6 parts sand. If sand is coarse, use 5 parts sand.

Type N mortar is recommended for all exterior walls, except retaining walls.

APPENDIX III-B

GLOSSARY

Absorbent--The taking in of moisture or water.

Abutment--A support wall carrying the end of a bridge and sustaining the pressure of the earth on it.

Accelerator--Speeds the hardening of mortar and concrete.

Admixtures--Additives to mortar, such as coloring agents, to retard or hasten setting.

Air space--A cavity in the wall or between building materials.

Alumina--A mineral containing clay and used in brick making.

Angle brick--Bricks shaped at an angle to fit sharp corners.

Arcade--Used to support columns or used on piers, and attached or detached to a wall.

Arch axis--The median line of the arch ring.

Arris--An external edge made by two surfaces (plane or curved).

Ashlar line--The main line of a wall of the superstructure.

ASTM--American Society for Testing and Materials.

Axis--Center of any rotating object.

Backboard--A board on the outside of a scaffold.

Backup--A masonry wall behind an exterior facing.

Balanced--In correct proportion and level.

Bat--A piece of brick.

Bearing blocks--Used to support the ends of particular beams.

Binders--Brick that extends part of the distance across the wall.

Bind header--Brick headers concealed in the interior of a wall.

Body brick--Bricks that are baked hardest and with the least distortion.

Bond course--Consisting of units that overlap more than one wythe of masonry.

Bonder--A bonding unit.

Breast wall--Built to prevent the falling of a vertical face cut into the natural soil.

Broken range--The continuity of the course is broken at intervals.

Bugged finish--Produced by grinding with power sanders.

Buttering--Using a trowel to place mortar on a masonry unit.

Camber--A small rise of a jack arch.

Capital--A column cap.

Cell--A hollow space in building tile.

Chain bond--Using chain, iron bars built into masonry.

Chimney lining--Terra cotta material or clay used inside of a chimney.

Clip--Portion of brick cut to length.

Code (Building)--Regulations and laws which govern the materials, location, and workmanship in building construction.

Collar joint--A vertical or longitudinal joint between wythes of masonry.

Concrete--Mixture of Portland cement, aggregates, and water.

Corbel--A shelf projected out from face of the wall; successive courses to form a ledge.

Course bed--Stone, brick, and materials in position with other materials to be laid.

Cove--A concave molding used in composition of a cornice.

Crown--In symmetrical arches, the crown is at mid-span.

Culls--Rejected brick.

Cut stone--Finished stone ready to set in place.

Damp-proofing--Applying coatings of compound that repel water. Can be applied to back or face of a stone wall.

Dimensioned stone--Precut and shaped to a specific size.

Dowels--Metal bars used to connect sections of masonry.

Edgeset--Bricks set on the narrow side, not flat.

Expansion joint--A vertical joint or space for expansion due to change of temperatures.

Extrados--A convex curve that bonds the upper parts of the arch.

Face brick--A specially prepared, well-burned brick used for attractive appearance for the face of a wall.

Fat mortar--A sticky mortar which will adhere to a trowel.

Fire brick--Brick made of refractory ceramic material which resists high temperatures.

Fireproofing--A material or combination of materials protecting structural members to increase the fire resistance.

Flare header--A header darker in color than other parts of the wall.

Float--A flat, broad-bladed metal or wooden hand tool.

Flue--A chimney passage for exit of smoke and gases.

Flue lining--A smooth, hollow tile for projecting flues.

Flush--Surfaces being even with each other.

Flushed--Filled up to the surface.

FTI--Facing Tile Institute.

Full header--Course consisting of all the headers.

Gage--Tools to measure for a particular purpose.

Glazed tile--Tile finished with a glass-like surface.

Grout--A mixture consisting of Portland cement, lime, and aggregate.

Hard-burned--Vitrified clay products fired at high temperatures.

Header tile--Tile that contains recesses for brick headers in masonry walls.

Hearth--The portion of the fireplace level with the floor, upon which the fire is built.

Hydrated Lime--The usual material used to add lime to mortar.

Incise--Cut inwardly or engrave.

Interlocking--Binding of particles one with another.

Jack arch--Horizontal or near-horizontal upper and lower surfaces, or flat or straight arch.

Jamb--Side of an opening, such as a door or window.

Jointer--A tool used to smooth or indent the surface of a mortar joint.

Key--Relative position of headers of courses in relation to a vertical line.

Keystone--Center masonry unit of the arch.

Lap--Distance one brick extends over another.

Lean mortar--Deficient in cementitious components and hard to spread.

Line--Strings stretched from lead to lead as a guide to lay top edge of a brick course.

Linear foot--A foot measurement along a straight line.

Lintel--Beam placed over a wall opening.

Lock--Used to secure a bond in masonry.

Mantel--A shelf projecting above the fireplace opening.

Masonry cement--Mill-mixed mortar to which sand and water are added.

Mortar--A plastic mixture of cementitious materials, fire aggregate, and water.

Mortar box--Box in which mortar is mixed and softened by water.

Natural bed--Surface of stone parallel to the stratification.

Outrigger--Joist projecting out of a window to support an outside scaffold.

Overhang--The face of a wall leaning vertically away from a wall.

Parging--Process of applying coats of cement mortar to masonry.

Paving--Placing stones or bricks to form a floor.

Pier--An isolated column of masonry.

Pitch--To square a stone.

Plastic--In the form of a sticky paste.

Plumb bob--Lead weight used to taut the plumb line.

Painting--Troweling mortar into joints after masonry units are laid.

Painting trowel--A small tool used to fill joints on exposed walls.

Raggle--Groove in joint to receive roofing or flashing.

Rake--End of a wall that racks back.

RBM--Reinforced brick masonry.

Reglet--Recesses to receive and secure metal flashing.

Riprap--Rough stones of various size placed irregularly and closely together to prevent scouring by water.

Rowlock course--Bricks set on edge.

Sag--A depression in a horizontal line.

Scant--Slight slope inward from the plumb line.

Selects--Acceptable bricks after the culling.

Shank--The part between blade and handle of a trowel.

Silica--Mineral contained in clay used for making bricks.

Sill block--Concrete masonry units for sills of openings.

Soap--Brick or tile with normal face dimensions having a nominal 2-inch thickness.

Soffit--Underside of an arch, lintel, or beam.

Solar screen--Perforated wall used as sunshade.

Span--Distance to be covered by an arch.

Splay--A slope, particularly on sides of doors and windows.

Story high--Heights of floor joists.

Story pole--Marked pole to measure masonry during construction.

Struck joint--Mortar joint finished with a trowel.

Temper--Mix to get mortar in proper condition to use.

Tender--Laborer who tends masons.

Termite shield--Barrier of sheet metal placed in masonry to prevent passage of termites.

Tie--Unit of material that connects masonry to masonry or other materials.

Tuck painting--Filling with fresh mortar for defective mortar joints.

Voussoir--Wedge-shaped masonry units which form an arch ring.

Wall tie--Metal pieces to connect wythes of masonry to each other.

Weep holes--Openings in mortar joints at level of flashing so moisture will escape.

Wythe--Continuous vertical section of masonry, one unit in thickness.

Working drawing--Drawing, describing, and showing details and dimensions of an object to be built.

STUDENT INFORMATION SHEET
RESIDENTIAL ELECTRICIAN

UNIT: Electrical Safety

TOPIC: Grounding

ESSENTIAL ELEMENT(S):
(a)(4)
(a)(7)(A)
(a)(7)(C)
(e)(3)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to demonstrate skills associated with electrical safety.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to use grounding techniques correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used with electrical safety will include application of reading concepts and skills and oral and written communications.*

GROUNDING INFORMATION

There are two divisions of the grounding problem: system grounding and equipment grounding.

System grounding is the connection of the neutral conductor of the wiring system to the earth. The purpose is to drain off any excessively high voltage that could accidentally enter the system as a result of lightning, insulation breakdown in the supply transformer, or contact between service wires. The size of the grounding conductor is determined by the size of the service conductors. In a grounded system, an accidental grounding would cause the breaker to open up and disconnect the live conductors.

Equipment grounding means exposing noncurrent-carrying metal of the wiring system to the earth. This includes raceways, boxes, and other components, and metal enclosures of equipment. It reduces danger of shock in case a live conductor comes in contact with these conductive parts. The incoming and outgoing steel conduits connect together and then connect to a grounding terminal.

TYPE OF GROUNDING

The continuous underground metallic cold water system is generally acknowledged as the best electrical ground. An electrode that is driven into the ground (such as steel pipe, copper rod, a buried iron or copper plate) is also a type of ground.

The system and equipment ground connection should be made at the same service entrance. Multiple grounds may be tied together to avoid difference of potential among parts of a system. Complete rules for grounding are contained in the *National Electrical Code* and should be studied thoroughly.

If a ground rod is used, a star-shaped rod is best. This rod is stiffer and has better contact with the earth's surface. Various types of grounding are shown on TM-1.

Any rods or pipes that have been coated with lacquer, paraffin, or any protective coating should not be used. In locations where moisture may be salty or acid, only rods made of copper and corrosion-resistant materials should be used.

GROUNDING CONDUCTOR

An identified service conductor is bolted directly to the neutral block so it cannot be disconnected from the source.

SCAFFOLDING

When working on and installing electrical work, grounded wooden scaffolding should be used. If the scaffold has wheels, they should be locked in place before starting work to prevent any unwanted movement. The top of the scaffold should also be tied off to prevent movement. Be sure to use a ladder to get on the scaffold. Do not use the braces to climb up.

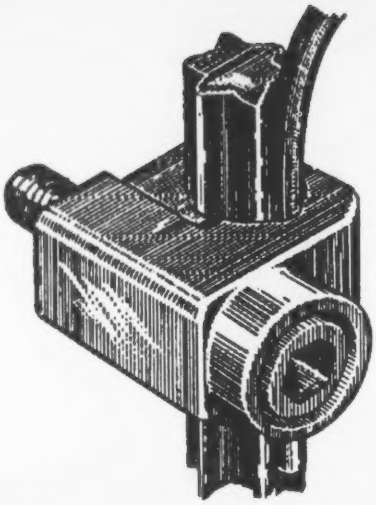
When using scaffolds and ladders, be aware of overhead wiring or exposed wiring. Always be aware of the existing wiring.

TEMPORARY WIRING

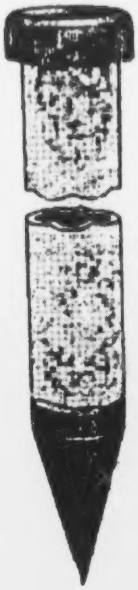
Temporary wiring is to provide electrical power during construction, remodeling, or doing repairs. Temporary wiring is to be used only for a short period of time and then should be removed. Information on temporary wiring can be obtained from the *National Electrical Code,* article 305.

Temporary wiring can be used on construction sites until construction is completed. It can also be used in testing and for experimental use.

Temporary wiring and devices should be kept in a safe place and, if possible, overhead. Temporary devices should be inspected frequently for any damage. Any device used outside, where there is exposure to weather or dampness, should be weatherproofed.



Grounding Clamp for a Star Rod



Grounding Rod

ASSIGNMENT SHEET

RESIDENTIAL ELECTRICIAN

NAME: ______________________________ **DATE:** ____________________

UNIT: Electrical Safety

TOPIC: Grounding

ESSENTIAL ELEMENT(S):
(a)(4)
(a)(7)(A)
(a)(7)(C)
(e)(3)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to demonstrate skills associated with electrical safety.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will be able to use grounding techniques correctly.

REFERENCE:
IV-I-A -IS
B.T. I-Unit V

DIRECTIONS: Circle the letter of the term(s) that best complete(s) each statement.

1. The size of the grounding conductor is determined by the size of the _______________ in a system.

   A. ground rods
   B. breakers
   C. service conductors
   D. size wire

2. System grounding is the connection of the _______________ to the earth.

   A. conduit
   B. service panel
   C. transformer
   D. neutral conductor

3. System and equipment grounding should be made at the same ______________ entrance with one or more grounds.

   A. panel box
   B. service
   C. pipe system
   D. ground rod

4. If a ground rod is used, a ______________-shaped rod is best to use.

   A. round
   B. square
   C. hexagon
   D. star

5. In areas where moisture is salty or acidic, only rods made of ______________ material should be used.

   A. iron
   B. corrosive
   C. steel
   D. non-corrosive

6. What would be the voltage drop of 100 feet of AWG 10 copper wire carrying 30A? _____ volts

7. If a contractor purchases $240.00 worth of electrical supplies and pays for it within ten days, he gets a 5% discount. How much was saved by paying before the ten days?

8. What percentage of 87 is 14%?

9. A contractor worked 12 electricians 30 hours a week for 4 weeks. What is the total hours worked?

10. A length of AWG 10 copper wire 125 feet long is needed, and it costs the contractor $1.80 per foot. How much is the wire?

STUDENT INFORMATION SHEET
RESIDENTIAL ELECTRICIAN

UNIT:	Electrical Theory
TOPIC:	Circuits
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(B) (a)(7)(C) (e)(3)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct an electrical circuit.
SPECIFIC OBJECTIVE(S):	After completing this information sheet, the student(s) will be able to construct the series and parallel circuits correctly.
BASIC ACADEMIC SKILLS APPLICATION:	*Basic academic skills used with electrical theory will include mathematical principles, application of reading concepts and skills, and oral and written communication skills.*

SERIES CIRCUIT

The current flowing through all parts of a series circuit is the same. Removal of a light or any appliance in a series circuit will break the flow of current. There is only one current path in a series circuit and only one wire connected to a terminal. The important thing to remember is that all of the current (*amperes*) leaving the source returns to the source. It is also important to remember in circuit work that no matter how complicated, the resistance in a series circuit is equal to the sum of all the individual resistors.

PARALLEL CIRCUIT

In a parallel circuit (shown on TM-2), each lamp is connected in a circuit of its own. This complete path is being formed through the source and connecting wires without involving the other lamps. If each lamp takes one ampere, the total current will be five amperes as shown. If any one of the lamps were removed, the total current would reduce by one ampere.

The amount of current flowing in a parallel circuit is in direct proportion to the number of units connected. As more units are connected, more current flows through the wires.

BRANCH CIRCUITS

The branch circuits used in a dwelling usually will be divided into several categories, such as general purpose circuits, small appliance circuits, and individual circuits.

The general purpose includes lighting consisting of arc lamps, incandescent lamps, fixtures, and discharge lamps. All rooms, attics, basements, and porches should have at least one lighting outlet.

The number of circuits should fall in one of two categories: (1) Those which carry the individual devices such as space heaters, water heaters, and large appliances. (2) The general type that includes feed outlets for lighting or receptacles.

The electric water heater should be on a separate circuit and connected to a 30A, 240V circuit.

The clothes dryer is rated around 5W and should be on a separate circuit, which is a 30A, 240V circuit, also.

The dishwasher is usually placed on a 20A, 120V kitchen appliance circuit.

VOLTAGE DROP

In order to determine the voltage drop in a circuit, a simple formula can be employed to find resistance.

The resistance formula is:

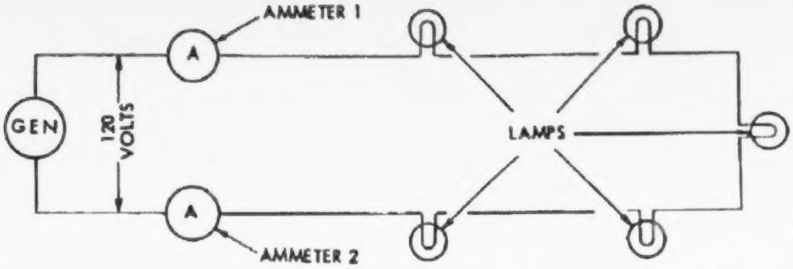
$$\mathbf{R = \frac{K \times L}{D^2}}$$

R = resistance in ohms

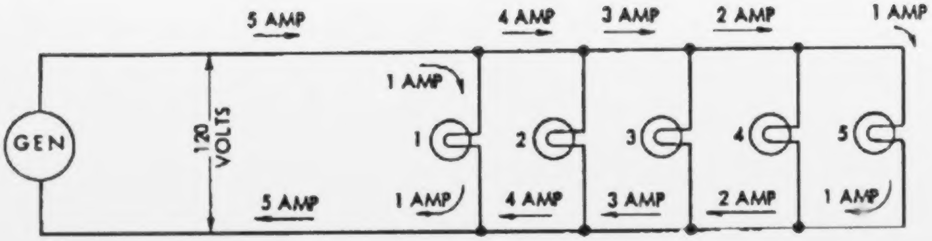
K = the constant whose value depends on the conductor, examples being: **brass** 42, **aluminum** 17, **copper** 10.8, **silver** 9.6, **steel** 33.

L = length in feet (both wires)

D = diameter of wire in thousandths of an inch or mils (1/1000-inch is known as a mil.)


AMMETER 1
A
GEN
120 VOLTS
LAMPS
A
AMMETER 2

SERIES CIRCUIT


5 AMP
4 AMP
3 AMP
2 AMP
1 AMP
1 AMP
GEN
120 VOLTS
1
2
3
4
5
5 AMP
1 AMP
4 AMP
3 AMP
2 AMP
1 AMP

PARALLEL CIRCUIT

ASSIGNMENT SHEET
RESIDENTIAL ELECTRICIAN

NAME: ______________________ **DATE:** ______________

UNIT:	Electrical Theory
TOPIC:	Circuits
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(B) (a)(7)(C) (e)(3)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct an electrical circuit.
SPECIFIC OBJECTIVE(S):	After completing this assignment sheet, the student(s) will be able to construct the series and parallel circuits correctly.
REFERENCE:	IV-2-A-IS B.T. I-Unit V
DIRECTIONS:	Answer the questions in the spaces provided below.

1. What will happen in a series circuit if one or more of the lights burn out?

2. Draw a sketch of a series circuit using five lamps.

3. Draw a sketch of a parallel circuit using five lamps.

4. The K-values for ohms resistance for brass, aluminum, and copper are:

5. As more units are connected to a parallel circuit, would the current decrease or increase?

6. Using the formula R = E/I, calculate and find the resistance for 440 volts, 10 amps.

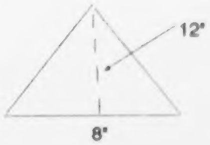
_____ohms

7. Using the formula I = E/R, find the amperage for 120 volts, 40 ohms.

_____amps

8. Calculate the area for a triangle.

A = _____square inches.



JOB SHEET

RESIDENTIAL ELECTRICIAN

NAME: ______________________________ **DATE:** ____________________

UNIT:	Electrical Theory
NAME OF JOB:	Constructing a Series Circuit
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(B) (a)(7)(C) (e)(3)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct an electrical circuit.
SPECIFIC OBJECTIVE(S):	Upon completion of this lesson, the student(s) will be able to construct a series circuit correctly.
TOOLS AND EQUIPMENT:	Diagonal pliers with stripping hole, linesman's pliers, standard screwdriver, tape measure or folding rule
MATERIALS:	#14 wire, four light sockets with wires, tape, one male plug end, four light bulbs
GENERAL INSTRUCTIONS:	Cut 10 feet of wire into four pieces. Tie in lights and plug into an outlet. All lights will burn; if one bulb is removed, the remaining lights will not burn.

PROCEDURES AND/OR TASKS:

1. Cut ten feet of wire into four pieces.

2. Strip the ends back on each piece, and remove one inch of insulation.

3. Loosen set screws on the male plug.

4. Attach one end of wire to one side of the plug, and tighten it down.

5. Attach one side of the other end of wire to a light socket, twist ends together and wrap with tape.

6. Tie other side of end to the next piece of wire. Twist ends and tape.

7. Repeat steps 5 and 6 until all four sockets are tied into line.

8. Take the end of the last wire, and connect it to the male plug across from the first connection.

9. Screw in light bulbs.

10. Be sure there are no bare wires at connections.

11. Have your instructor check circuit before connecting to power source.

12. Connect to power source, and be sure to plug in securely.

13. All lights should be burning.

14. Remove one bulb; others will go out. When bulb is returned, others will come back on.

STUDENT INFORMATION SHEET
RESIDENTIAL ELECTRICIAN

UNIT: Electrical Theory

TOPIC: Circuit Components

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(B)
(a)(7)(C)
(e)(3)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct an electrical circuit.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to use the color code, identify and install circuit components correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used with electrical theory will include mathematical principles, application of reading concepts and skills, and oral and written communication skills.*

WIRE COLOR CODE

The current-carrying conductors use black, red, blue, and yellow, usually in that order. The neutral wire is usually white or a natural gray color. The grounding wire is usually green, green with yellow stripes, or bare.

WIRE SIZES

All wire carrying alternating current is insulated and sizes are determined by number--the larger the number, the smaller the diameter of the wire. The size of wire is easily determined by using a wire gauge. A No. 8, or larger, wire is either solid or stranded. No.'s 6, 4, and 2 are always stranded.

Wire size is important for two reasons:

(1) **Ampacity**, which is the safe current-carrying capacity, is important because of its heat-shedding ability.

(2) **Voltage drop** is the loss of voltage due to resistance when electrons are forced over a long distance or over a cross sectional area which is too small.

The most common type of wire covering is rubber or plastic. Because they are excellent nonconductors of electricity, other coverings such as jute, paper, and additional plastic are used.

CIRCUIT CONTROLS

Fuses and breakers protect the circuits and have the ability to turn power on and off, but they are not very convenient. For this reason, switches are used to operate the sections of the circuits. There are many types of switches, such as the lighted-handle switch, standard toggle switch, and key-operated switch. The switches act as circuit controllers. When the switch is in the "off" position, the flow of electricity is stopped, and the circuit cannot be used until the switch is turned to the "on" position.

Some other types of switches are: dimmer switch, time-delay switch, three-way switch, push button switch, photoelectric switch, locking switch, and several other types of switches to be applied to different situations.

ENERGY CONSUMERS

The electrical circuit distributes the electrical energy to one or more uses in the circuit. The termed loads are essentially resistors, which in turn impede the flow of electricity and at the same time consume the energy provided.

The resistance is present in other components of the electric circuit. Also included are conductors, controllers, sources, and protectors which all offer some resistance. The resistance of an electric circuit is measured in OHMS. The unit of measurement is defined in terms of current and voltage. One ohm is the resistance which will permit the flow of one ampere of current when one volt of electrical force is applied.

ASSIGNMENT SHEET
RESIDENTIAL ELECTRICIAN

NAME: ______________________ **DATE:** ______________

UNIT:	Electrical Theory
TOPIC:	Circuit Components
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(B) (a)(7)(C) (e)(3)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct an electrical circuit.
SPECIFIC OBJECTIVE(S)	After completing this assignment sheet, the student(s) will be able to use the color code, identify and install circuit components correctly.
REFERENCE:	IV-2-B-IS B.T. I-Unit V
DIRECTIONS:	Read and answer each of the following questions in the spaces provided.

1. The neutral wires are usually what color?

2. What number of wire size can be either solid or stranded?

3. The number 6, 4, and 2 wires are always______________.

4. The devices that protect the circuits are fuses and ______________, and they will also turn circuits on and off.

5. Why is it more convenient to have switches than to have only breakers?

JOB SHEET
RESIDENTIAL ELECTRICIAN

NAME: ______________________________ **DATE:** ____________________

UNIT:	Electrical Theory
NAME OF JOB:	Wiring a Single Pole Switch Controlling a Single Light Outlet Supply Line Entering a Light Outlet Box
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(B) (a)(7)(C) (e)(3)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to use color code, and identify and install circuit components correctly.
SPECIFIC OBJECTIVE(S):	Upon completion of this lesson, the student(s) will be able to install circuit components correctly.
TOOLS AND EQUIPMENT:	Device box, octagon box, wire staples, bar hanger, stud wall or practice board, 3/8" cable clamp, twist-on wire connectors, two 16 penny nails, two drywall nails, hammer, standard screwdriver, line technician's pliers, longnose pliers, pocket knife, wire strippers, tool pouch, drill motor or bit brace, 3/4" wood bit, extension cord, safety glasses
MATERIALS:	12-2-G or 14-2-G NM cable, single pole switch, light socket, 120 volt supply, 120 volt incandescent bulb
GENERAL INSTRUCTIONS:	This activity can be used as a simulated work task in any building trades program. Student(s) can apply skills aquired in completing specified job task at a job site. Instructor should advise as needed. Use proper safety precautions.

PROCEDURES AND/OR TASKS:

1. Put on safety glasses.
2. Mount boxes: the switch box and ceiling outlet box can be at any height.
3. Remove a 1/2" knockout from panel and install cable connector.
4. Plug drill into power source and drill holes for the cable.
5. Drill holes for the cable as close to the center of a 2" x 4" as possible; Be sure to hold drill firmly to keep from causing an injury.
6. Install the cable as shown in Figure 1; Leave at least 6" to 8" of cable extending out of the outlet boxes.
7. The cable should be stapled within at least 6" of the outlet boxes.
8. Check to be sure that the cable clamps and connectors are secure.
9. Strip the ends of the cable to within 1/4" of point of entry into the box.
10. Use caution not to cut a finger or hand when stripping wire.
11. Be sure to connect all the grounding conductors (green or bare) as shown in Figure 2. Be sure to leave enough conductor to remove and reconnect if needed.
12. Be sure to connect all neutral conductors (white or neutral grey) as shown in Figure 3. The grounded conductor goes from the ground terminal to the panel to the light and stops.
13. Make up the outlet box. In switching situations, you are allowed to use white or grey as the switch leg.
14. Install the conductors on the switch. The white and black can go on either screw, while the ground goes on the green screw.
15. Install in the switch box.
16. Install the ungrounded conductor into the appropriate overcurrent protection.
17. Be sure switch is in off position, turn on breaker.
18. Next turn on switch.
19. Have instructor check work.
20. Turn the breaker off.
21. Replace tools and materials.
22. Clean work area.

Figure 1

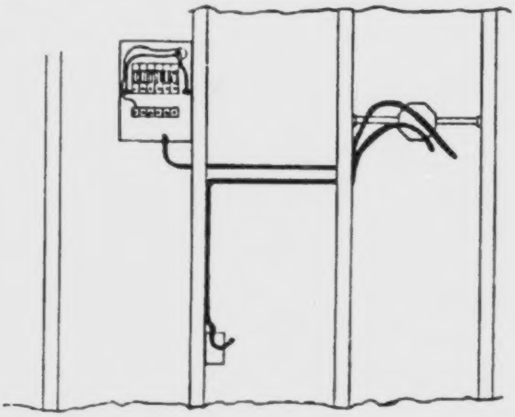


Figure 2

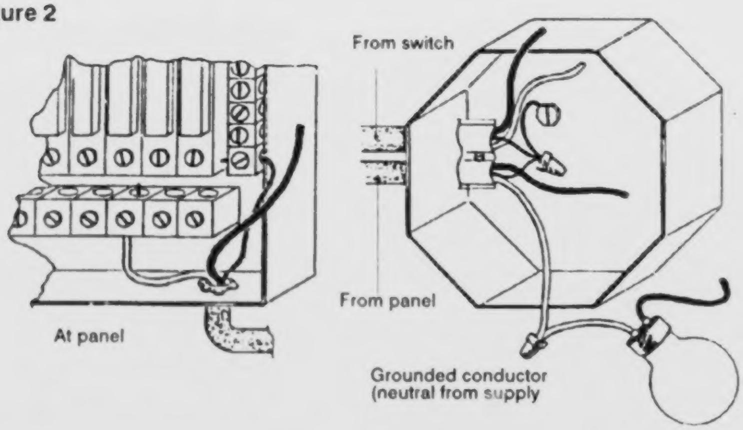
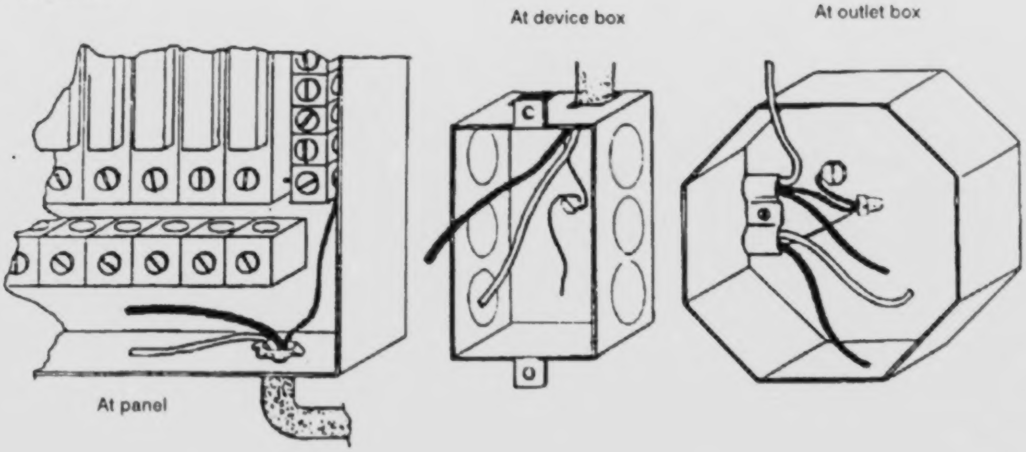

From switch
At panel
From panel
Grounded conductor
(neutral from supply

Figure 3


At device box
At outlet box
At panel

STUDENT INFORMATION SHEET
RESIDENTIAL ELECTRICIAN

UNIT:	Blueprints and Drawings
TOPIC:	Electrical Floor Plan
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (e)(3)(A)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to demonstrate the knowledge and ability to read and interpret blueprints and drawings.
SPECIFIC OBJECTIVE(S):	After completing this information sheet, the student(s) will be able to read and interpret electrical floor plans correctly.
BASIC ACADEMIC SKILLS APPLICATION:	*Basic academic skills used when reading blueprints and drawings will include oral and written communications, application of reading concepts and skills, and mathematical principles.*

ELECTRICAL PRINTS

The switches and outlets for lights in commercial buildings and residences are shown on floor plans. The routing of wiring and circuits is usually done by the electrical contractor. Electricians have to be able to understand and read blueprints. They need to know the run of ceiling joists and floor joists.

An electrical layout shows where the panel, switches, outlets, and lights are placed on the floor plan and is marked "electrical plans."

Circuits should be wired with a size wire and circuit breaker that are sufficient to carry the amps required by the appliances in a residence. An individual circuit for a 240-volt oven range would use 12,000 watts and would require a 50-amp circuit breaker (12,000/240 = 50 amps), so this circuit should be a 60-amp circuit and use a #6 size wire.

The conductors, or wire, in most projects are specified to be copper. According to the *National Electrical Code*, the #14 wire is the smallest that can be used for branch circuits.

IV-3-A-AS

ASSIGNMENT SHEET
RESIDENTIAL ELECTRICIAN

NAME: ______________________________ **DATE:** ________________

UNIT:	Blueprints and Drawings
TOPIC:	Electrical Floor Plan
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (e)(3)(A)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to demonstrate the knowledge and ability to read and interpret blueprints and drawings.
SPECIFIC OBJECTIVE(S):	After completing this assignment sheet, the student(s) will be able to read and interpret electrical floor plans correctly.
REFERENCE:	IV-3-A-IS B.T. I-Unit V
DIRECTIONS:	Read the following questions, and answer in space provided below.

1. What plans show switches and outlets?

2. The routing of circuits and wiring is done by______________.

3. If a 240-volt oven range required a 50-amp breaker circuit, it would be carrying ________________ watts.

4. What type of wire is specified for most projects?

5. What is the smallest wire to be used in a branch circuit according to the *N.E.C.*?

JOB SHEET

RESIDENTIAL ELECTRICIAN

NAME: ______________________ DATE: ______________

UNIT:	Blueprints and Drawings
NAME OF JOB:	Sketching Outlets And Switches
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (e)(3)(A)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to demonstrate the knowledge and ability to read and interpret blueprints and drawings.
SPECIFIC OBJECTIVE(S):	Upon completion of this lesson, the student(s) will be able to read and use blueprints and drawings used in residence and light commercial wiring plans correctly.
TOOLS AND EQUIPMENT:	Pencil, ruler
MATERIALS:	Forms from blueprint section for electrical floor plans
GENERAL INSTRUCTIONS:	Symbols are shown in Building Trades I, pages 749 and 750. Be sure to use the right symbols. Study the blueprint you are using, then draw the outlets, switches, and kitchen light in ceiling.

PROCEDURES AND/OR TASKS:

1. Use the blueprint "Electrical Floor Plan" from blueprint section provided by the instructor.

2. Place the blank electrical plan by the original.

3. Look at the plan and find each outlet, switch, and the two ceiling light outlets.

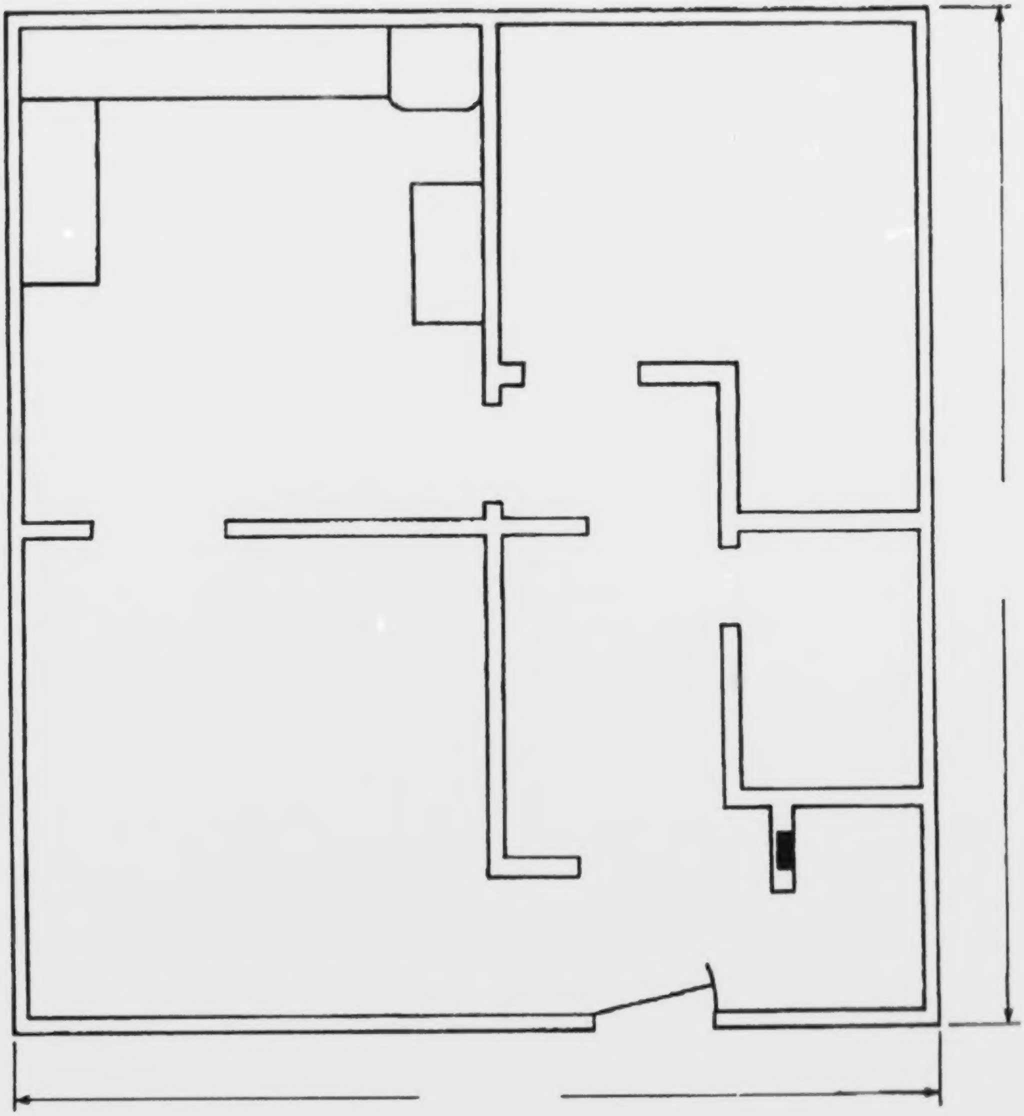
4. First, draw the outlets on the sketch provided.

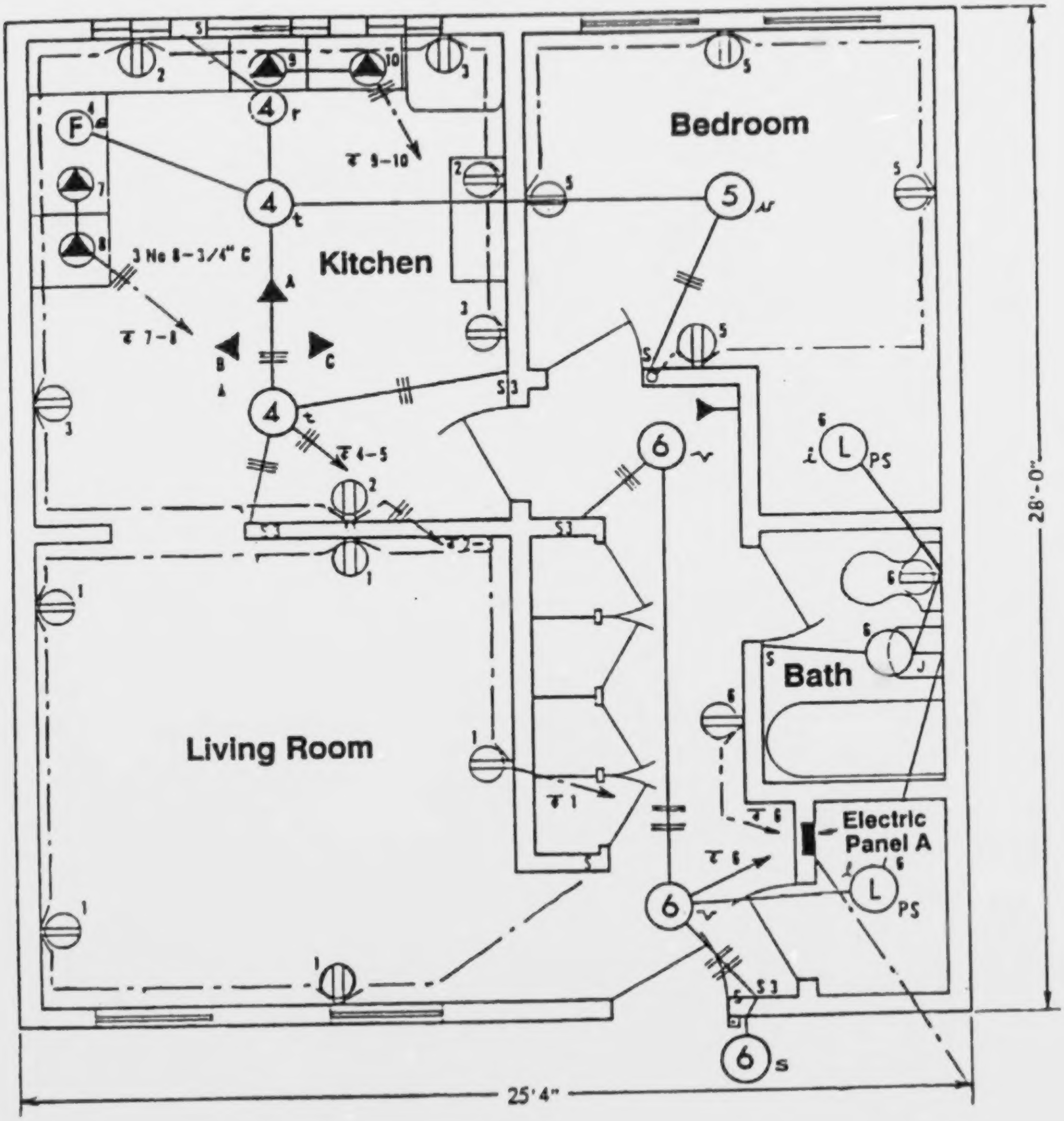
5. Draw the switches on the new sketch.

6. Draw the two ceiling outlets on the sketch, and draw lines to show connection to S3 switches.

7. Be sure outlets are numbered as in blueprint. These numbers tell which circuit breaker they connect to.

8. When you have drawn in everything, have your instructor check your plan.




Bedroom
Kitchen
Living Room
Bath
Electric Panel A
3 No 8-3/4" C
25'4"
28'-0"
PS
PS

STUDENT INFORMATION SHEET

RESIDENTIAL ELECTRICIAN

UNIT: Blueprints and Drawings

TOPIC: Wiring Circuits

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(e)(3)(A)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to demonstrate the knowledge and ability to read and interpret blueprints and drawings.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to use the blueprint correctly to wire circuits.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used when reading blueprints and drawings will include oral and written communications, application of reading concepts and skills, and mathematical principles.*

CIRCUITS

The electrician will be given the electrical plans by the builder, architect, or owner. Sometimes electricians will draw or sketch their own plans. When more than one electrician is working with the plans, each may contribute to a work record. When a section is done, the electrician working can mark the circuit completed with a colored marker or pen, and the next person will know this circuit is complete and go on to the next one, as shown in TM-3, Wiring Circuit. If the outlets are switch-controlled, this will be shown as a dash, but the line will be curved, not straight.

SWITCHES

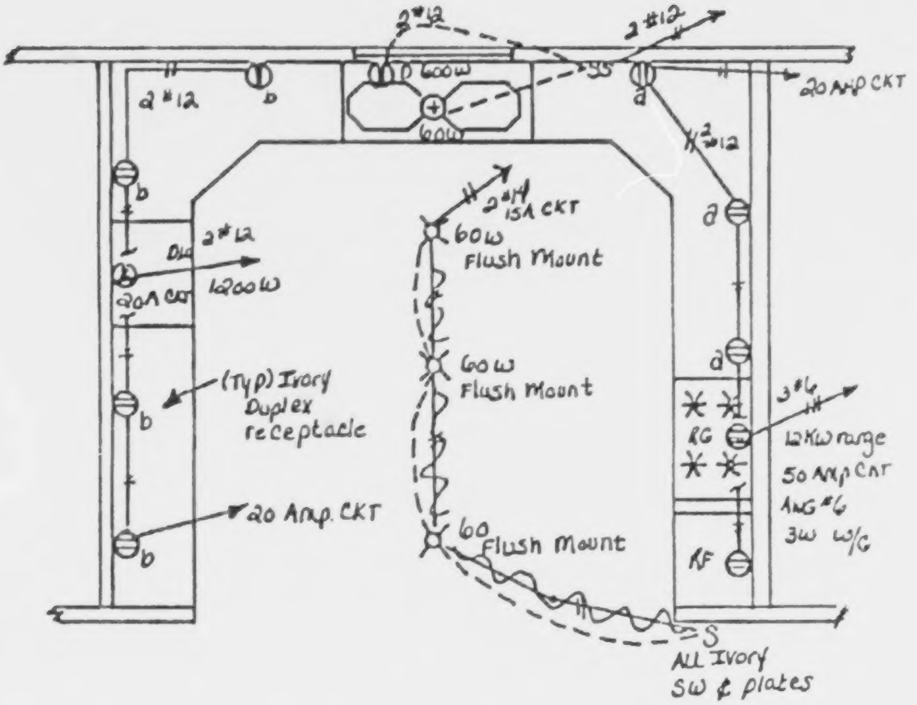
The three-way switch is usually used where there are two entrances to a room or building, and lighting can be controlled from either entrance.

OUTDOOR WIRING

Most switches, lights, and receptacles are not suited for installation outside. There are codes that require special housing for outlets and lamps used outside. Most receptacles and switches can be used outside, but they have to be installed in a weatherproof housing. This type of wiring should not be used unless it is properly protected.

Weatherproof conductors can be buried directly or, if possible, run through conduit and buried 18 to 24 inches deep. Where the cable enters the ground, plastic or rigid metal conduit should be used. This will protect against physical damage and help keep the outdoor wiring safe.

Most electrical codes require weatherproof boxes for outside switches and receptacles. Most have a rubber gasket that seals the box off to keep out moisture.


2#12
2#12
2#12
b
600w
60w
SS
a
20 Amp CKT
2 #12
b
a
2#14 15A CKT
60w Flush Mount
DW
2#12
20A CKT
1200w
60w Flush Mount
a
(Typ) Ivory Duplex receptacle
b
3#6
RG
12KW range
50 Amp CKT
AWG #6
3w w/G
b
20 Amp. CKT
60 Flush Mount
RF
S
All Ivory
SW & plates

WIRING CIRCUIT

TM-3

ASSIGNMENT SHEET
RESIDENTIAL ELECTRICIAN

NAME: ______________________________ **DATE:** ____________________

UNIT: Blueprints and Drawings

TOPIC: Wiring Circuits

ESSENTIAL ELEMENT(S): (a)(7)(A)
(a)(7)(C)
(e)(3)(A)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to demonstrate the knowledge and ability to read and interpret blueprints and drawings.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will be able to use the blueprint correctly to wire circuits.

REFERENCE: IV-3-B-IS
B.T. I-Unit V

DIRECTIONS: Read the questions below, and answer in the spaces provided.

1. The ______________ is usually given the electrical plans.

2. If a switch controls an outlet, it is shown by a ______________ line.

3. How are blueprints used as a work record?

4. When one or more lights can be controlled from two entrances, a _______________ switch is used.

5. What type of box is required for outside wiring?

717

JOB SHEET

RESIDENTIAL ELECTRICIAN

NAME: ______________________________ **DATE:** ____________________

UNIT: Blueprints and Drawings

NAME OF JOB: Use of Electrical Symbols

ESSENTIAL ELEMENT(S): (a)(7)(A)
(a)(7)(C)
(e)(3)(A)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to demonstrate the knowledge and ability to read and interpret blueprints and drawings.

SPECIFIC OBJECTIVE(S): Upon completing this lesson, the student(s) will be able to use the blueprint correctly to wire circuits.

TOOLS AND EQUIPMENT: Sharp pencil, fractions rule

MATERIALS: 11 1/2" x 20" paper; first floor plan sheet from back of student manual.

GENERAL INSTRUCTIONS: Draw to 1/4" = 1' 0" scale; drawing and placing symbols where they go will help to locate symbols when looking at blueprints and working drawings.

PROCEDURES AND/OR TASKS:

1. Collect materials needed to complete this task.
2. Draw floor plan, showing outside and inside walls.
3. Draw ceiling light symbols and switches.
4. Show how they connect ceiling lights and switches.

5. Draw all receptacle symbols as shown on the blueprint.
6. Check to be sure all dimensions and marks are clear and correct.
7. When complete, give to instructor for evaluation.

STUDENT INFORMATION SHEET
RESIDENTIAL ELECTRICIAN

UNIT: Electrical Installation

TOPIC: Ceiling Fans

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(3)(B)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install ceiling fans, room air-conditioning units, garbage disposals, and ballast protectors.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to install ceiling fans correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used with electrical installation will include mathematics, application of reading concepts and skills, and oral and written communication skills.*

CEILING FAN INFORMATION

Ceiling fans usually extend about nine inches below the eight-foot ceiling. Some things involved for safe support are: the weight of the fan, vibration, and turning motion of the fan.

Most fans are supported by metal brackets nailed to runners in the ceiling or by an adjustable hanger installed in the ceiling. The electrician should install a junction box where the fan is to be located; the box must be well secured.

Most 32-inch ceiling fans draw 50 to 80 watts. This is 0.5 to 0.75 ampere at 120 volts. For most fans, the switching can be done by using the pull chain switch (off-on-high-med-low) which is part of the fan itself. Most fans are reversible. Most fans are wired in at the junction box installed in the ceiling with the mounting bracket. Always read instructions that come with the ceiling fan to be certain the mounting you use will be safe and your power supply is 120 volts. Be sure power is turned off before installing the fan.

ASSIGNMENT SHEET
RESIDENTIAL ELECTRICIAN

NAME: ______________________________ **DATE:** __________________

UNIT: Electrical Installation

TOPIC: Ceiling Fans

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(3)(B)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install ceiling fans, room air-conditioning units, garbage disposals, and ballast protectors.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will be able to install ceiling fans correctly.

REFERENCE:
IV-4-A-IS
B.T. I-Unit V

DIRECTIONS: Circle the letter of the correct response, and fill in the blank with the proper term(s) to complete each statement.

1. For an eight-foot ceiling, a fan should be ______________ from the ceiling.

   A. 12 inches
   B. 14 inches
   C. 9 inches
   D. 11 inches

2. Most ceiling fans are supported by a ______________ bracket.

   A. plastic
   B. metal
   C. wood
   D. wire

3. A 32-inch ceiling fan will draw ______________ watts.

A. 30 to 40
B. 50 to 80
C. 60 to 80
D. 50 to 70

4. A ________________ power supply should be used for ceiling fans.

A. 110-volt
B. 120-volt
C. 220-volt
D. 240-volt

5. Ceiling fans are installed because they are ____________________.

A. pretty
B. economical
C. used to circulate air
D. handy to have
E. none of above

6. Using the formula E = IR, find the voltage for 20 amps, 6 ohms.

______ volts.

7. Using the formula E = IR, find the voltage for 9.6 amps, 2.5 ohms.

_____ volts.

JOB SHEET

RESIDENTIAL ELECTRICIAN

NAME: ________________________________ **DATE:** ____________________

UNIT: Electrical Installation

NAME OF JOB: Installing a Ceiling Fan Hanger

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(3)(B)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install ceiling fans, room air-conditioning units, garbage disposals, and ballast protectors.

SPECIFIC OBJECTIVE(S): Upon completion of this lesson, the student(s) will be able to install a hanger correctly for support of a ceiling fan.

TOOLS AND EQUIPMENT: Four one-inch wood screws, screwdriver, tape measure, four sixteen-penny nails, hammer

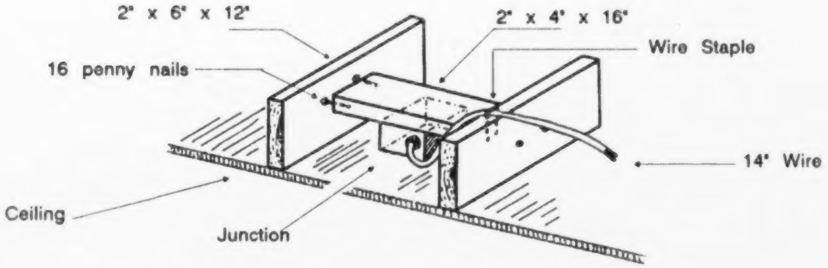
MATERIALS: One junction box; one nonmetallic, sheathed cable connector; two 2" x 6" x 1'; one 2" x 4" x 16"; 24 inches of #14 romax wire; and an electrical square-wire staple

GENERAL INSTRUCTIONS: By learning how to properly construct a support hanger for the ceiling fan, you will not have to worry about it working loose and falling.

PROCEDURES AND/OR TASKS:

1. Lay out material on work bench.

2. Lay 2 x 4 down flat, and place back of junction box on center of 2 x 4.
3. Screw four wood screws through the junction box to secure it to the 2 x 4.
4. Knock out one hole on the side of the junction box with a screwdriver.
5. Install sheathed cable connector.
6. Turn 2 x 4 over, and set junction box down on flat surface.
7. Set one 2 x 6 lengthwise on each end of the 2 x 4.
8. Drive two sixteenpenny nails through the 2 x 6 into the end of the 2 x 4. Repeat this on the other side.
9. Loosen screw on cable connector; put 6" of wire through connector, and tighten again.
10. Lay the rest of the wire over the top of the 2 x 6; then put a wire staple over the wire, and drive it into the top of 2 x 6 with a hammer until it comes into contact with the wire cover.
11. When the hanger is installed in ceiling, push nails gently through ceiling at the edge of the junction box; then ceiling portion can be cut away from inside room to fit size of junction box. The fan cover will then hide the hole.



STUDENT INFORMATION SHEET

RESIDENTIAL ELECTRICIAN

UNIT: Electrical Installation

TOPIC: Room Air-Conditioning Units

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(3)(B)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install ceiling fans, room air-conditioning units, garbage disposals, and ballast protectors.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to install room air-conditioners correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used with electrical installation will include mathematics, application of reading concepts and skills, and oral and written communication skills.*

GENERAL INFORMATION

The room air conditioner is connected to 240 volts or 120 volts and is usually rated between 4 and 10 amperes. The typical air conditioner may be rated 1.5 KVA (240V x 6.25A). This air conditioner would be put on a 15A double-pole breaker or on a receptacle as shown on TM-4, for 240-volt units.

The 120 volt air conditioner can be plugged into any regular outlet. Air conditioners can also be tied into the same circuit as heating units, because they would not be operating at the same time. This would save installing an extra circuit.

According to the *National Electrical Code*, a disconnect for an air conditioner is required within sight of the unit and should be accessible. For appliances with the cord and plug connection, the cord and plug are considered to be the disconnecting devices.

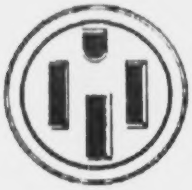
If the label on an air conditioner reads "maximum size fuse 40 amperes," only the 40-ampere fuse can be used. If the name plate states "maximum over current protection," then a fuse or a circuit breaker can be used.

Some terms that are unique to air conditioners, heat pumps, and hermetically-sealed motor compressors are:

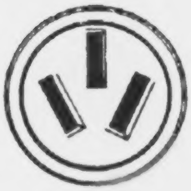
Related-load current--current used when the unit is operating at related load, a rated frequency, and rated voltage.

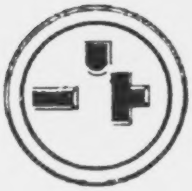
Branch-circuit selection current--the value in amperes used instead of related-load current to determine conductor sizes, disconnect switch size, controller size, ground fault, and short-circuit protective device sizes. The branch circuit current is always equal or greater than related-load current marked on equipment labels.

125/250V Receptacle

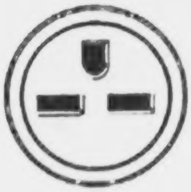


125/250V Receptacle



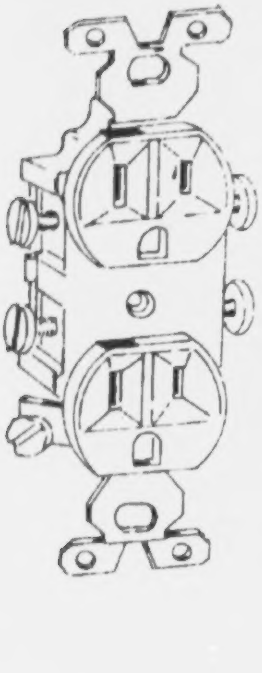


125V Receptacle



250V Receptacle

Duplex Receptacle



ASSIGNMENT SHEET
RESIDENTIAL ELECTRICIAN

NAME: ______________________________ **DATE:** ____________________

UNIT:	Electrical Installation
TOPIC:	Room Air-Conditioning Units
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(3)(B)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install ceiling fans, room air-conditioning units, garbage disposals, and ballast protectors.
SPECIFIC OBJECTIVE(S):	After completing this assignment sheet, the student(s) will be able to install room air conditioners correctly.
REFERENCE:	IV-4-B-IS B.T. I-Unit V
DIRECTIONS:	Complete the following statements by writing the correct word(s) in the blanks.

1. Air conditioners are connected to ______________ or ______________ volts.

2. Room air conditioners are usually rated from 4 to ______________ amperes.

3. The 240-volt air conditioner would be put on a ______________ double-pole breaker.

4. The ______________ -volt air conditioner unit can be connected to regular receptacles.

5. The room air conditioner can also be tied into the same circuit as ______________.

6. Using the formula $I = E/R$, find the amperage for 440 volts, 20 ohms.

_____ amps.

JOB SHEET
RESIDENTIAL ELECTRICIAN

NAME: ______________________________ DATE: ____________________

UNIT: Electrical Installation

NAME OF JOB: Install a Fixed Appliance Equipped with Pigtail to a Branch Circuit

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(3)(B)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install ceiling fans, room air-conditioning units, garbage disposals, and ballast protectors correctly.

SPECIFIC OBJECTIVE(S): Upon completing this lesson, the student(s) will be able to install a fixed appliance to a branch circuit correctly.

TOOLS AND EQUIPMENT: Box (be sure box will accommodate conductors being used), cover, fixed appliance with pigtail, screwdriver, pocket knife, wire stripper, safety glasses, practice wall

MATERIALS: Connectors, two # 12 x 1" metal screws, wire connectors

GENERAL INSTRUCTIONS: This activity can be used as a simulated work task in any building trades program. Student(s) can apply skills aquired in completing specified job task at a job site. Use proper safety precautions.

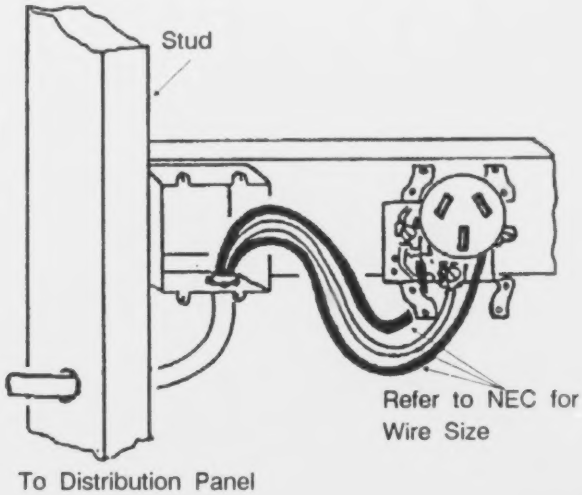
PROCEDURES AND/OR TASKS:

1. Gather tools, equipment, and materials needed for task.
2. Determine the box location.

CAUTION: Be sure box is located close enough to make connection to the appliance.

3. Mount the box.
4. Install the branch circuit conductors in the box.
5. Position box so the pigtail will reach it.
6. Connect pigtail to box (See Figure 1).
7. Splice conductors to branch circuit and install caps.
8. Install cover plate on box.
9. Position appliance to be used.
10. Have instructor check work.
11. Replace tools and materials.
12. Clean work area.

Figure 1


Stud
Refer to NEC for Wire Size
To Distribution Panel

STUDENT INFORMATION SHEET
RESIDENTIAL ELECTRICIAN

UNIT: Electrical Installation

TOPIC: Garbage Disposal

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(3)(B)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install ceiling fans, room air-conditioning units, garbage disposals, and ballast protectors.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to install a garbage disposal correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used with electrical installation will include mathematics, application of reading concepts and skills, and oral and written communication skills.*

GENERAL INFORMATION

The garbage disposal may be connected directly to the panel circuit breaker from a plug or cord connection, but it is connected most often to an on-off switch at counter level on the cabinet. The disposal is usually 12 volt and rated approximately 5 to 9A.

Garbage disposals are motor-operated and must have over-current protection not to exceed 125 percent of the full load-current rating.

When installed, the disposal is usually attached by the plumber to the bottom of the sink and to the waste pipe.

In addition to the disposal, there may be circumstances when it is necessary to run a larger branch circuit in order to install a dishwasher near the kitchen sink area. A 30-ampere circuit would be needed to feed the dishwasher and the disposal, instead of two 20-ampere circuits. The electrician should split the circuit in the junction box, located under the cabinet set up for the food disposal.

The disposal or dishwasher should not be connected to any small appliance circuits. The small appliance circuit is for cord-connected portable appliances only. The dishwasher must be grounded when installed. Because it is a motor-operated appliance, it requires over-current protection. If the electrician is to provide the protection, this will be part of the installation of the unit. If a unit has appropriate fuses, this will also serve as a disconnect and can be installed under the sink. This type of disconnect is covered in *National Electric Code,* sections 421-22, 422-24, and 422-26.

ASSIGNMENT SHEET
RESIDENTIAL ELECTRICIAN

NAME: ______________________________ **DATE:** ____________________

UNIT: Electrical Installation

TOPIC: Garbage Disposal

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(3)(B)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install ceiling fans, room air-conditioning units, garbage disposals, and ballast protectors.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will be able to install a garbage disposal correctly.

REFERENCE:
IV-4-C-IS
B.T. I-Unit V

DIRECTIONS: Read the following questions, and insert the correct word(s) in the space provided.

1. Disposals can be connected directly to the ______________ circuit breaker.
2. Most of the units are connected to a(n) ______________ switch on the cabinet counter.
3. Disposals are usually operated by ______________ volts.
4. Most disposals are operated by ____.
5. Disposals attach to the bottom of the ______________________________.

IV-4-C-JS-1

JOB SHEET

RESIDENTIAL ELECTRICIAN

NAME: ______________________________ **DATE:** ____________________

UNIT: Electrical Installation

NAME OF JOB: Install A Garbage Disposal

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(3)(B)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install ceiling fans, room air-conditioning units, garbage disposals, and ballast protectors correctly.

SPECIFIC OBJECTIVE(S): Upon completing this lesson, the student(s) will be able to install a garbage disposal correctly.

TOOLS AND EQUIPMENT: Adjustable spud wrench or all-purpose wrench, strainer wrench, 2" tubing cutter, practice wall, tester

MATERIALS: Garbage disposal unit, pipe compound, 12-2-G or 14-2-G wire cable, one junction box, one switch box, one single pole switch, four twist caps

GENERAL INSTRUCTIONS: This activity can be used as a simulated work task in any building trades program. Student(s) can apply skills aquired in completing specified job task at a job site. Use proper safety precautions.

PROCEDURES AND/OR TASKS:

1. Assemble tools and materials needed.

2. Remove garbage disposal from carton and carefully read manufacturers' instructions.
3. Remove the sink tailpiece using an adjustable spud wrench.
4. Using the strainer wrench, loosen the basket strainer.
5. Position the disposal unit under the sink.
6. Screw the basket strainer into the top of disposal unit and tighten locknut using the strainer wrench.
7. Install the continuous waste drain into the disposal unit and tighten slip joints with adjustable spud wrench.

   NOTE: You should use a (Venluri) tee in the continuous waste drain.
8. Install the trap between the unit and waste drain, and tighten the slip joints with the adjustable wrench.
9. Turn water on at sink, let run one to two minutes, and check for leaks.
10. The electrician will hook up the disposal.
11. The disposal should be connected to a 20 amp breaker in a control panel.
12. Be sure power is off.
13. Check wires with tester to be sure power is off.
14. Connect the wires coming from the switch to the disposal.
15. Connect the ground wire first and secure.
16. Connect the white or neutral wire next.
17. Strip 3/4" of insulation from end of wire.
18. Use line technician pliers to twist wire ends.
19. Install insulated caps.
20. Repeat steps 16 through 19 with black wire.
21. Be sure switch is off.
22. Go to control panel and turn breaker on.
23. Using switch at counter top, turn on disposal.
24. After motor starts, turn switch off.
25. Have instructor check work.
26. Replace tools and materials.
27. Clean work area.

STUDENT INFORMATION SHEET

RESIDENTIAL ELECTRICIAN

UNIT: Electrical Installation

TOPIC: Ballast Protector

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(3)(B)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install ceiling fans, room air-conditioning units, garbage disposals, and ballast protectors.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to install ballast protectors correctly .

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used with electrical installation will include mathematics, application of reading concepts and skills, and oral and written communication skills.*

GENERAL INFORMATION

The ballast for indoor fluorescent lights has a built-in thermal protector which is installed by the manufacturer of the ballast.

The Class-P ballast has a case temperature not to exceed 90° C. The thermal protector opens when temperature of the case reaches 110° C.

The reason for protection is to prevent possible fire due to overheating. Some ballast failures have resulted in fires.

An extra protector for the ballast is an in-line fuse holder connected in series with the black line lead and black ballast lead. The in-line fuse acts as a disconnect for the ballast. To replace a ballast, the fuse is removed to disconnect the ballast.

In-line protection has already been discussed. The most commonly used protection for residences is circuit breakers. These breakers consist of a carefully calibrated bimetallic strip, similar to a thermostat. When enough current flows through the strip, it will bend, open the contacts, and interrupt the circuit. This is what happens when a switch is opened or a fuse blows.

Circuit breakers are rated in amperes and are tested to carry 110 percent of the rated load indefinitely without tripping. When a breaker trips, the cause can be corrected and the breaker reset. The circuit breaker is a good over-current protector and does not trip or temporarily overload. Breakers are available in standard rating from 15-amp to 200-amp sizes. However, larger sizes can be purchased if needed.

IV-4-D-AS

ASSIGNMENT SHEET

RESIDENTIAL ELECTRICIAN

NAME: ______________________________ **DATE:** ____________________

UNIT: Electrical Installation

TOPIC: Ballast Protector

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(3)(B)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install ceiling fans, room air-conditioning units, garbage disposals, and ballast protectors.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will be able to install ballast protectors correctly.

REFERENCE:
IV-4-D-IS
B.T. I-Unit V

DIRECTIONS: Read and answer the following questions in the space provided.

1. Why is protection for the ballast important?

2. At what degree does the thermal protector open?

3. The ______________ can be used in-line for ballast protection.

4. To replace a ballast, the ______________ should be removed.

5. Where is the fuse holder installed?

JOB SHEET

RESIDENTIAL ELECTRICIAN

NAME: ______________________________ **DATE:** ____________________

UNIT: Electrical Installation

NAME OF JOB: Installing In-Line Fuse Holder

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(3)(B)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install ceiling fans, room air-conditioning units, garbage disposals, and ballast protectors.

SPECIFIC OBJECTIVE(S): Upon completion of this lesson, the student(s) will be able to install an in-line protector for fluorescent light fixtures correctly.

TOOLS AND EQUIPMENT: Side-cutting pliers, wire stripper, screwdriver

MATERIALS: 1 fluorescent light fixture, 2 wire caps, 1 in-line fuse holder (Light fixture can be obtained from electrical contractor, electrician, or school maintenance. Instructor should make this available; this can be used again in other classes.)

GENERAL INSTRUCTIONS: Installing an in-line fuse protector will protect the ballast and help to prevent a fire in case of ballast overheating.

PROCEDURES AND/OR TASKS:

1. Assemble tools and materials needed to install fuse holder.

2. Be sure power service to light fixture is off.
3. Remove bulbs from fixture and lay aside.
4. Loosen screws or clips holding cover on.
5. Remove cover and lay aside.
6. Locate black wire going from ballast to power source.
7. Disconnect where wire is tied to the power source.
8. Take one end of in-line fuse holder, tie it to power source, and screw wire cap on. Be sure all the stripped wire is inside cap.
9. Repeat step 8 for end going to ballast.
10. Be sure fuse is in holder and holder is clipped together tightly.
11. Have instructor check procedures.
12. Install cover over ballast and wires.
13. Install bulbs back in fixture.
14. The fixture is ready for power source to be turned on.
15. Have instructor evaluate when complete.

APPENDIX IV-A

ELECTRICAL FORMULAS

Voltage Drop:

VD= 1 x KL/CM

VD - voltage drop in volts

1 - amperage in amperes

K - a constant of 10.8

L - length of copper conductor in feet (one way)

CM - circular mils

Resistance:

$$R = \frac{K \times L}{d^2}$$

R - resistance in ohms

K - a constant whose value depends on the conductor (see list)

L - length in feet (both wires)

D - diameter of the wire in thousandths of an inch or mil
(1/1000-inch is known as 1 "mil")

List:

K values for ohms resistance per MIL-Foot (at 70° F)

Aluminum	17
Brass	42
Copper	10.8
Iron	60
Silver	9.6
Steel	75
Tungston	33

Power Loss:

Power = E x I

Power loss - E (line drop) x I (or $I^2R = P$ = copper losses)

APPENDIX IV-B

GLOSSARY

AIEE--American Institute of Electrical Engineers.

Alternating Current (AC)--Current that changes direction 60 times per second.

Ammeter--Measures electric current in amperes.

Ampacity--Current-carrying capacity in amperes.

Amperes--The electron flow of one coulomb per second.

ANSI--American National Standards Institute.

Appliance--A current-consuming device.

Apprentice--A beginner in a given trade.

Armor--Metal wrapping to protect conductors.

AWG--American Wire Gauge.

Box--Enclosed panel for connecting conductors or mounting devices.

Branch circuit--Part of a system which extends beyond control devices.

Bus--Common connection for two or more circuits.

Cable--Arrangement of conductors in a protective covering.

Candle--Unit of brightness.

Cation--A positively charged ion.

Center tap--Connection made to center of a coil.

Centimeter--One-hundredth part of a meter; .3937 inches.

Circuit--Conducting path for electrons.

Condenser--Device that stores an electrical charge.

Conductor--Substance that allows electrons to flow freely through it.

Contact--Device which opens and closes to complete or interrupt a circuit.

CSA--Canadian Standards Association.

Current--Rate of electron flow; 1 ampere is equal to one coulomb per second.

Dead--An electrical system having no charge or voltage.

Demand--Amount of power that a power company must supply at a given time or period.

Direct Current (DC)--Steady current which does not vary.

Drop voltage--Electromotive force needed to cause current to flow through a resistor.

Electricity--Energy related to the atomic structure of matter.

Electrode--Conducting substance in which electricity goes to and from a device.

Electrolyte--Liquid that provides good electrical conduction.

EMT--Electrical metallic tubing.

Energy--Electrical energy is measured in watt seconds.

Entrance, Service--Electrical installation from the service drop to the main breaker box.

Farad--A unit of capacitance.

Fish tape--Wire used to pull wire through conduit.

Fuse--A current-limiting device that contains an element which will melt when high temperature contacts it.

GFCI--Ground Fault Circuit Interrupter.

Grounded--The condition of having a proper ground.

Henry--A unit of inductance.

Hertz--The frequency or cycles per second.

Horsepower--33,000 ft. lbs. of work per minute or 550 ft. lbs. of work per second equals one horsepower. Also 746 watts = 1 horsepower.

Hot--Carrying a current, danger of shock.

IAEI--International Association of Electrical Inspectors.

IBEW--International Brotherhood of Electrical Workers.

IES--Illuminating Engineering Society.

Insulation--Poor conductor of electricity that is used to cover wires and components to prevent shorts and shock hazards.

Jacket--Outer nonmetallic covering applied over insulated cable or wire.

Jumper--A length of wire used to connect a portion of a circuit.

Junction box--Enclosure for electrical connections.

Kilo--Meaning one thousand times.

Kilowatt--One thousand watts.

Line drop--Voltage drop due to resistance in an electrical conductor.

Loads--Devices that tax a circuit and use electrical energy.

Lumen--Unit of measurement for the flow of light.

Magnetic field--Space around a magnet in which magnetic forces are detected.

Main--Circuit which supplies all others, main disconnect.

MEGA--The numerical prefix meaning 1,000,000.

MHO--Unit of conductance.

Milliammeter--An instrument measuring electric currents in milliamperes.

Milliampere--One-thousandth of an ampere, 1 x 10^3 amperes or .001 amperes.

MTW--Machine Tool Wire.

Multimeter--Combination volt, ampere, and ohm meter (VOM).

National Electrical Code--Rules and regulations used by the electrician when installing electrical wiring, appliances, and machinery.

Network--A series-parallel circuit.

Neutral--Neither positive nor negative.

NFPA--National Fire Protection Association.

Nonconductor--Material which does not conduct electricity.

OHM--Unit of electrical resistance.

Ohmmeter--Instrument used to measure circuit resistance.

OHM's Law--Electrical circuit law which states the current is proportional to the voltage, but inversely proportional to the resistance, reactance, or impedance.

Oscilloscope--Displays AC wave-forms.

OSHA--Occupational Safety and Health Act. A law passed in 1970 to protect people in places of employment.

Outlet--Point which current is supplied to a load.

Over-current--Current in excess of the rated current of equipment or conductors.

Plug--A conductor designed to be inserted into an electrical receptacle.

Polarity--Current flow direction designation.

Power--The rate of doing work.

Primary--Input winding of a transformer.

Relay--Circuit which activates other parts of the circuit.

Resistance--The opposition to current flow.

Resistor--A component of an electric circuit that opposes current flow.

Series circuit--Circuit having a single path for current to flow.

Service drop--The connecting wires from the power lines to the entry of a building.

Shunt--A parallel connection in a circuit.

Sine wave--Wave formed by a single-frequency, alternating current.

Single phase--One alternating current or voltage produced or used.

Snake--Flexible wire used to pull wires through conduit.

Socket--Device used for connection of a plug or bulb.

Solder--A thin alloy used to bond wires electrically.

Splice--Connection of two or more conductors.

Strand--Single, uninsulated conductor.

Switch--Device used to open and close a circuit.

Tap--Method of drawing current from a conductor.

Terminal--Point where connections are made.

Three-way switch--A switch used to switch current in either of two paths in a circuit.

Transformer--Regulatory device to step up, or step down, current or voltage for transfer use.

Volt--Unit of electrical pressure (voltage).

Voltage--The electromotive force along the conductor of a circuit.

Volt-Ampere--Unit of electrical power.

Voltmeter--Used to measure voltage values.

VOM--A test instrument that combines ohmmeter, voltmeter, milliammeter.

Watertight--Made so moisture will not enter.

Watt--Unit of electrical power.

Wattmeter--Measures electrical power.

Weatherproof--process designed to protect electrical devices from the weather.

Wire--A conductor, bare or insulated.

Wiring diagram--Shows electrical symbols and devices and their interconnections.

Zero adjust--Mechanical means for setting a meter point on the zero mark of the meter scale.

Zero potential--Zero voltage; no electrical potential.

STUDENT INFORMATION SHEET

PAINTING AND DECORATING

UNIT:	Surface Preparation
TOPIC:	Safety
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(5)(F) (e)(4)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to apply safety principles correctly when preparing walls and will be able to estimate paint accurately.
SPECIFIC OBJECTIVE(S):	After completing this information sheet, the student(s) will identify and analyze safety principles associated with surface preparation correctly.
BASIC ACADEMIC SKILLS APPLICATION:	*Basic academic skills used with surface preparation will include application of reading skills, oral and written communications, and mathematical principles.*

SAFETY INFORMATION

Good safety practices are a must when handling ladders and scaffolding. Leaving ladders and scaffolding unattended may cause accidents (children might even be tempted to play with the equipment), such as a serious fall, or the ladder or scaffold could fall on top of someone. When work is done, ladders and scaffolds should be taken down and stored. This will prevent injuries and protect the equipment from theft.

Never carry a knife or a sharp tool in any of your pockets when climbing on a ladder or scaffold. This could result in injury to you or someone standing close by, should you fall. Never climb on a ladder until the spreader bars are locked in place.

Always read the label on paint and other similar products. A label tells you what is in the product, how the material should be handled and stored, and contains safety warnings about first aid in case of an accident. If possible, use nontoxic paints and primers, especially where small children and pets may come in contact with, or have access to, these materials.

Be certain that rags used with oil-based paints or thinners are disposed of, since they can cause fires (spontaneous combustion). Always check paint and thinner containers to be certain they are properly closed.

Be sure to wear rubber gloves when using a liquid deglosser or trisodium phosphate (TSP) cleaner.

Always turn electricity off before removing light fixtures and wallplates on outlets and switches.

When using any type of power equipment, such as a sander, electric drill, power saw, etc., always wear goggles and a face mask. Never wear loose clothes while operating power tools. (Button or roll up sleeves, tuck in shirttail, etc.)

SPRAYER SAFETY

Sprayers can be very helpful, especially when painting areas that would normally be difficult to reach with a roller or brush.

Even airless sprayers can pose a safety hazard. These sprayers operate at extremely high pressures--some of them up to 3,000 pounds per square inch. If the nozzle is close to your hand or arms, the pressure could inject you with paint which could result in tissue damage and blood poisoning. If, while operating a sprayer, you feel something similar to a pinprick, seek medical attention.

When using a sprayer, check the safety switch in order to prevent accidental discharges. Some precautions you should observe are:

1. Keep the sprayer away from children.
2. Never point the sprayer at anyone.
3. The tip should never be cleaned until the sprayer is disconnected and trigger and relief valve are pressed to release the pressure.

ASSIGNMENT SHEET
PAINTING AND DECORATING

NAME:____________________________________**DATE:**_______________________

UNIT: Surface Preparation

TOPIC: Safety

ESSENTIAL ELEMENT(S): (a)(7)(A)
(a)(5)(E)
(e)(4)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to apply safety principles correctly when preparing walls and will be able to estimate paint accurately.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will identify and analyze safety principles associated with surface preparation correctly.

REFERENCES: V-I-A-IS

DIRECTIONS: Read and answer the following questions by circling the **T** for **TRUE** or **F** for **FALSE.**

T F 1. Ladders and scaffolds should be put away when not in use.

T F 2. The rags used to clean oil-based paint are not safety hazards.

T F 3. Rags and cleaning supplies should be disposed of after use.

T F 4. Thinner cans should be left open for easier use.

T F 5. Fumes from thinner and oil-based paints could cause fires.

T F 6. Paint and thinner can labels have important information on them.

T F 7. The can labels have first-aid information on them.

T F 8. Electrical plates and fixtures can be removed with electricity on.

T F 9. Toxic materials should be disposed of after use.

T F 10. Most knives or sharp instruments should not be carried in your pockets when climbing a ladder.

V-1-A-JS-1

JOB SHEET

PAINTING AND DECORATING

NAME:__________________________________ **DATE:**____________________

UNIT: Surface Preparation

NAME OF JOB: Safety on Labels

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(5)(F)
(e)(4)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to apply safety principles correctly when preparing walls and will be able to estimate paint accurately.

SPECIFIC OBJECTIVE(S): Upon completion of this lesson, the student(s) will identify and state the purpose of safety labels correctly.

TOOLS AND EQUIPMENT: None required.

MATERIALS: Labels from two different paint cans, labels from two different type thinner cans, paper

GENERAL INSTRUCTIONS: Acquire labels from paint cans and thinner cans. List first-aid steps, should you have an accident, from each label.

PROCEDURES AND/OR TASKS:

1. Read each label, and list what would need to be done for first aid.
2. Discuss with fellow students what first aid would be used with paints.
3. Discuss what first aid would be used with thinners.
4. Submit material and information to instructor for evaluation of report.

STUDENT INFORMATION SHEET
PAINTING AND DECORATING

UNIT: Surface Preparation

TOPIC: Wall Preparation

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(E)
(e)(4)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to apply safety principles correctly when preparing walls and will be able to estimate paint accurately.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to prepare wall surfaces correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used with surface preparation will include application of reading skills, oral and written communications, and mathematical principles.*

PREPARATION

Walls, ceilings, baseboards, and window trim must be cleaned before painting. If surfaces have previously been painted, be sure they are washed and allowed to dry. If any areas are cracked or flaking, be sure to scrape and clean to a solid surface around the area. This area should be buffed with an abrasive sandpaper to feather the edges. Any areas previously painted with a gloss paint should be sanded or have liquid sand applied before the surface is repainted to key the new paint.

FILLER

Before filling cracks or indentions, be sure they are free from dust, clean, and free from any loose material around the edges. Use a flexible putty knife when filling these areas. Apply spackling or caulk to the blade, press the blade end at the top of the crack and hold firmly; then slide down, filling the crack. Hold the knife so it is almost vertical, and you can remove the excess filler easily. If the crack is very deep, it is best to fill with two layers; fill the bottom of the crack and let dry some; then go back and fill to the surface. When larger cracks are repaired, you can use a plastic spreader to go over the surface and smooth the area being filled.

PRIMING

For areas where a filler has been applied, be sure it is completely dry. Rub these areas with sandpaper; be sure they are smooth. After this, the bare patches and repairs should be primed with a primer/sealer or a thinned coat of the paint to be used. Any type of rust or oil stain should be coated with kilz and allowed to dry so the stain will not bleed through your paint.

When painting over a galvanized material, go over it first with vinegar to keep it from peeling off, and then paint.

PAPERING WALLS

If old paper still sticks tightly to the walls, you can paper over it. One way to check for tightness is to run your fingers over the paper and listen for any crackling sound. If you find areas that have this sound, you should remove the paper. There are several ways to remove the paper if necessary.

1. Paper can be removed with a steamer, which can usually be rented from the wallpaper dealer. The vapor from the steamer will loosen the adhesive, and the paper can be lifted from the wall with a broad knife, much the same as with a chemical remover. You should begin at the top of each strip and work down. Take your time, and wait for the steam to penetrate the paper and loosen the paste.

2. Chemical removers are available but are not very effective when removing a non-porous covering. These coverings usually can be stripped or can be steamed loose as discussed above.

3. Some papers can just be pulled off the wall. Using a scraper, start at one bottom corner edge, lift up, and pull away from the wall. After all the paper is removed, wash the walls with clear water, and allow the wall to dry.

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ASSIGNMENT SHEET

PAINTING AND DECORATING

NAME:______________________________ DATE:____________________

UNIT: Surface Preparation

TOPIC: Wall Preparation

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(E)
(e)(4)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to apply safety principles correctly when preparing walls and will be able to estimate paint accurately.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will be able to prepare wall surfaces correctly.

REFERENCES:
V-I-B-IS
B.T. I-Unit VI

DIRECTIONS: Read and answer the following questions by circling **T** for **TRUE** or **F** for **FALSE**.

T F 1. All surfaces to be painted do not have to be cleaned.

T F 2. Cracked and peeling surfaces can be wiped off.

T F 3. Any gloss-painted areas should be sanded.

T F 4. Liquid sand can be used on a gloss surface before painting.

T F 5. Flaking paint should be scraped clean, then sanded.

T F 6. Cracks should be free from loose edges and dusted before being filled.

T F 7. A stiff putty knife should be used with filler.

T F 8. Excess filler should be left and sanded down.

T F 9. Cracks filled and sanded need to be primed.

T F 10. A thinned coat of paint can be used for primer.

JOB SHEET

PAINTING AND DECORATING

NAME:____________________________________**DATE:**______________________

UNIT:	Surface Preparation
NAME OF JOB:	Filling Cracks
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(E) (e)(4)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to apply safety principles correctly when preparing walls and will be able to estimate paint accurately.
SPECIFIC OBJECTIVE(S):	Upon completion of this lesson, the student(s) will be able to fill cracks in surface preparation correctly.
TOOLS AND EQUIPMENT:	Flexible putty knife, sandpaper, plastic spreader, small can of spackling, brush, rag
MATERIALS:	4′ x 4′ section of Sheetrock, small can of primer or paint
GENERAL INSTRUCTIONS:	Instructor should make indentions in Sheetrock or cut an area on the surface to be cleaned and repaired by the students.

PROCEDURES AND/OR TASKS:

1. Assemble tools and materials needed to repair damage to Sheetrock.
2. Use brush to clean out loose material on Sheetrock.
3. Take rag and wipe off area to be filled. Be sure it is clean.

4. Take putty knife and, using small amounts of spackling, fill cracks or indentions.
5. Smooth off crack or indention.
6. Using the knife, remove excess spackling, and smooth area repaired.
7. Let dry.
8. Buff area with sandpaper until smooth.
9. Clean dust from area with rag.
10. Use primer over repaired area, and let dry.
11. Notify instructor when completed for evaluation.

STUDENT INFORMATION SHEET
PAINTING AND DECORATING

UNIT:	Surface Preparation
TOPIC:	Estimating Paint
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(E) (e)(4)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to apply safety principles correctly when preparing walls and will be able to estimate paint accurately.
SPECIFIC OBJECTIVE(S):	After completing this information sheet, the student(s) will be able to estimate paint accurately.
BASIC ACADEMIC SKILLS APPLICATION:	*Basic academic skills used with surface preparation will include application of reading skills, oral and written communications, and mathematical principles.*

ESTIMATING

In estimating the amount of paint you need, you would first measure the perimeter of the room (the distance around the room; two times the length plus two times the width); multiply the perimeter by the height of the room (eight feet is the normal ceiling height). This will give you the square footage of wall area to be painted.

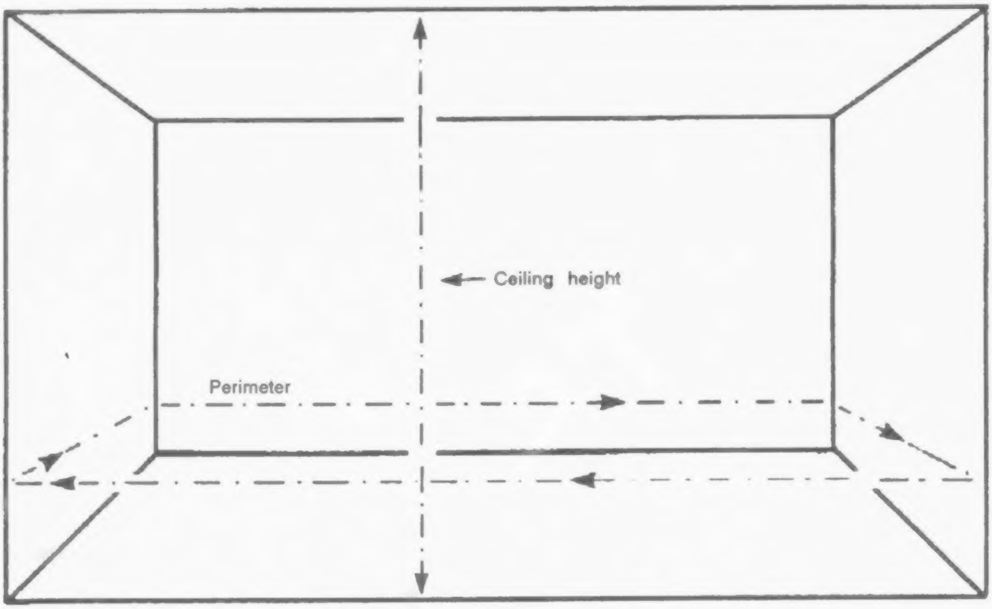
By multiplying the length by the width of a room, it will give you the square footage of the ceiling area. If you are painting the ceiling the same color, add this figure to the square footage of the walls. If the ceiling is a different color, you have to figure the amount of gallons for each paint.

The average coverage is 400 square feet per one gallon of paint. Divide the square footage by 400. This gives you the number of gallons you will need.

For example, for a room 12′ x 9′ with 8′ ceilings, with the ceiling painted the same color as the walls, you would estimate the following: 12′ + 12′ + 9′ + 9′ = 42′ (room perimeter); 42′ x 8′ = 336′ (square footage for walls); 12′ x 9′ = 108′ (for the ceiling's square footage); 336′ + 108′ = 444′ (total square footage); 444′ ÷ 400 = 1.11 gallons of paint. This tells you that you would need a little over one gallon of paint for the ceiling and walls.

To calculate the paint for just the ceiling, if it needs to be a different color, (using the above formula) figure 336′ square footage for the walls and 108′ square footage for ceiling; 336′ ÷ 400 = .84 (would be slightly less than one gallon of paint for the walls); 108′ ÷ 400′ = .27, about a quarter of a gallon for the ceiling alone.

Detail shows directions to measure:



ASSIGNMENT SHEET

PAINTING AND DECORATING

NAME:______________________________ DATE:__________________

UNIT: Surface Preparation

TOPIC: Estimating Paint

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(E)
(e)(4)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to apply safety principles correctly when preparing walls and will be able to estimate paint accurately.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will be able to estimate paint correctly.

REFERENCES:
V-1-C-IS
B.T. I-Unit VI

DIRECTIONS: Read the following questions, and place the correct answer in the space provided.

1. You should measure the __________ of a room first.

   A. end
   C. perimeter
   B. side
   D. length

2. The average coverage of a gallon of paint is __________ square feet.

   A. 300
   C. 600
   B. 400
   D. 500

3. If you multiply the length by the width of a room, it gives you the square footage of the ____________ area.

A. wall
B. end
C. floor
D. ceiling

4. Normal ceiling height is ___________.

A. 7′
B. 9′
C. 8′
D. 10′

5. If you divide the square footage by 400, this will give you the number of ____________ of paint you need.

A. amounts
B. colors
C. gallons
D. tints

6. If the ceiling was a different color, you would figure it ____________.

A. same
B. separately
C. together
D. none of the above

7. A drywall hanger needs a piece of sheetrock 88 inches long. Using 8 feet of sheetrock, how much will need to be cut off?

_______ inches.

8. A drywall hanger needs a piece of sheetrock 98 inches long. Using 10 feet of sheetrock, how much will need to be cut off?

_____ inches

JOB SHEET

PAINTING AND DECORATING

NAME:____________________________________DATE:____________________

UNIT:	Surface Preparation
TOPIC:	Estimating Paint
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(E) (e)(4)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to apply safety principles correctly when preparing walls and will be able to estimate paint accurately.
SPECIFIC OBJECTIVE(S):	Upon completion of this lesson, the student(s) will be able to estimate paint correctly.
TOOLS AND EQUIPMENT:	Pencil
MATERIALS:	Paper
GENERAL INSTRUCTIONS:	Using the formula from the information sheet, figure amount of paint needed to paint walls and ceilings same color for a 12′ x 12′ room.

PROCEDURES AND/OR TASKS:

1. Using paper and pencil, figure the amount of paint needed for a 12′ x 12′ room and ceiling the same color.
2. Show the calculations for each step.
3. When finished, give to instructor to evaluate.

STUDENT INFORMATION SHEET
PAINTING AND DECORATING

UNIT: Painting

TOPIC: Use of Primers

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(E)
(e)(4)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to apply primers, special paints, and special effects correctly.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to apply primers correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used with painting will include mathematical principles, oral and written communications, and application of reading concepts and skills.*

THE PRIMER

The primer should be used before painting, because it will seal underlying surfaces. This provides a better surface on which to apply the finish paint, because it is rough, and the finish paint will adhere to it.

Regardless of what kind of paint you use, it would be cheaper to use a primer than premium finish paint. A latex primer should be used for an unpainted wallboard or other surfaces. Most painters prefer an oil-based undercoat for latex or alkyd finishes.

If primer is not used, you will need to apply at least two coats of paint.

If the area to be painted has been painted before, it will probably require a primer to keep the pre-existing color from showing through the new coat of paint.

The complexity of primers covers a wide diversity of finish materials. They can cover special rust-inhibiting steel and many other metal household items. Masonry primers are used for water seepage and to fill holes in porous concrete.

Most of the best primers we have are marketed as stain killers or stain-locking finishes, because they will seal out smoke or water damage. You will have to choose where you need an oil-based primer or a water-based primer. Be sure what you use is compatible with the finish coat you use.

The aerosol primers are usually used for patches, woodwork, and small areas, but not for a large area.

ASSIGNMENT SHEET

PAINTING AND DECORATING

NAME:__________________________________**DATE:**____________________

UNIT:	Painting
TOPIC:	Use of Primers
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(E) (e)(4)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to apply primers, special paints, and special effects correctly.
SPECIFIC OBJECTIVE(S):	After completing this assignment sheet, the student(s) will be able to apply primers correctly.
REFERENCES:	V-2-A-IS B.T. I-Unit VI
DIRECTIONS:	Choose the correct response to complete each statement.

1. Primer is used to __________ a surface before painting.

    A. cover
    B. seal
    C. finish
    D. none of the above

2. It would be cheaper to use ___________ when starting to paint.

    A. sealer
    B. primer
    C. two coats of paint
    D. water-based paint

3. A(n) __________ type primer is best for unpainted wallboard.

A. oil-based
B. water-based
C. latex
D. paint

4. A(n) __________ type primer should be used for latex or alkyd finish.

A. water-based
B. latex
C. oil-based
D. paint

5. If a primer is not used, you would need to apply two coats of __________.

A. latex
B. paint
C. oil-based
D. none of the above

6. A(n) __________ type of primer should be used on steel and metal items.

A. oil-based
B. latex-based
C. water-based
D. none of the above

7. A(n) __________ type primer is used for water seepage in concrete.

A. oil-based
B. masonry
C. stonemasonry
D. none of the above

8. The best __________ is marketed as stain killers.

A. paint
B. primer
C. oil-based paint
D. latex-based paint

JOB SHEET

PAINTING AND DECORATING

NAME:____________________________________**DATE:**______________________

UNIT: Painting

TOPIC: Preparation and Prime Coating

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(E)
(e)(4)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to apply primers, special paints, and special effects correctly.

SPECIFIC OBJECTIVE(S): Upon completion of this lesson, the student(s) will be able to spray and apply primer correctly.

TOOLS AND EQUIPMENT: Sprayer equipment (air compressor, regulator, hoses, paint gun, etc.), flat paddle or shaker, face filter to cover nose and mouth, safety glasses, paint cloths, and covers

MATERIALS: Primer, thinner or solvent

GENERAL INSTRUCTIONS: This activity can be used as a simulated work task in any building trades program. Students can apply skills aquired in completing specified job task at a job site. Use proper safety precautions.

PROCEDURES AND/OR TASKS:

1. Spread paint cloths and covers over floor and furniture.
2. Be sure to read directions on primer container carefully.
3. The primer should be mixed according to directions on the container.

4. Be sure you have good ventilation.
5. Pour primer into the sprayer pot.
6. Instructor should assist in setting sprayer adjustment according to the type of sprayer used.
7. Check and adjust air and fluid flow of the spray gun.
8. Spray the primer on the wall, spraying from side to side in long strokes and releasing trigger just before the end of each stroke.
9. Overlap each stroke by one third the width of the spray pattern.
10. Spray a vertical stroke at the end of the wall section to complete the primer cover.
11. Two thin coats are better than one thick coat.
12. Have instructor check work.
13. Replace tools and materials.
14. Clean area, sprayer, and equipment.

STUDENT INFORMATION SHEET

PAINTING AND DECORATING

UNIT:	Painting
TOPIC:	Special Paints
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(E) (e)(4)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to apply primers, special paints, and special effects correctly.
SPECIFIC OBJECTIVE(S):	After completing this information sheet, the student(s) will be able to apply special paints correctly.
BASIC ACADEMIC SKILLS APPLICATION:	*Basic academic skills used with painting will include mathematical principles, oral and written communications, and application of reading concepts and skills.*

SPECIAL PAINTS

The ordinary oil- and/or water-based paint(s) sometimes will not meet your needs, especially when painting metal and ceramic tile. There are several special finishes available; some are expensive to use.

FINISH PAINTS AND PRIMERS

These products are made especially for metal surfaces. These paints are to prevent corrosion, and adhesion must be provided. Primers now contain zinc chromate, which is yellow in color, whereas some primers once contained blue and red lead. These primers and paints come in different colors.

EPOXY PAINT

The epoxy paints are usually fast-drying and sometimes leave brush marks. This type of paint is also scratch and scrub resistant. Epoxy paint is made of two parts and is extremely adhesive to surfaces such as metals, ceramic tiles, plastics, porcelain, or any nonporous surface.

TEXTURED PAINT

This paint usually has a thick consistency like a textured, flat, oil or latex paint. This paint can be applied with a carpet-type roller or with a plasterer's trowel to create a rough finish. Other textures can have sand or grainy additives mixed in the paint to make a rough finish. Doing this, when the paint dries, will help reduce glare. Because of the porosity, the texture- and sand-type paints tend to soak up more paint if repainted with a regular finish.

HEAT-RESISTANT PAINT

Before using this type of paint, the surface must be clean and free of rust. Usually you will not need a primer with this type of paint. This type of oil-based, heat-resistant paint is usually designed for materials subject to high temperatures, and can be used on items such as gas heater grills, fireplaces, and hoods so they will stay attractive after being used. Most of these paints have a limited selection of colors.

ASSIGNMENT SHEET
PAINTING AND DECORATING

NAME:______________________________**DATE:**____________________

UNIT:	Painting
TOPIC:	Special Paints
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(E) (e)(4)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to apply primers, special paints, and special effects correctly.
SPECIFIC OBJECTIVE(S):	After completing this assignment sheet, the student(s) will be able to apply special paints correctly.
REFERENCES:	V-2-B-IS B.T. I-Unit VI
DIRECTIONS:	Read and answer the following questions by circling **T** for **TRUE** or **F** for **FALSE.**

T F 1. You would need a special type of paint for ceramic tile.

T F 2. Primers are made just for wood surfaces.

T F 3. Zinc chromate is white in color.

T F 4. Special paints and primers prevent corrosion.

T F 5. Epoxy paints will not leave brush marks.

T F 6. Epoxy paint is usually used on nonporous surfaces.

T F 7. Textured paint is usually applied with a trowel or carpet roller.

T F 8. Textured surfaces use less paint when they are repainted.

T F 9. Textured paints reduce the glare.

T F 10. When applying heat-resistant paint, the surface does not have to be cleaned.

JOB SHEET

PAINTING AND DECORATING

NAME:______________________________DATE:____________________

UNIT:	Painting
TOPIC:	Using Roller to Apply Textured Paint
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(E) (e)(4)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to apply primers, special paints, and special effects correctly.
SPECIFIC OBJECTIVE(S):	Upon completion of this lesson, the student(s) will be able to apply special paints correctly.
TOOLS AND EQUIPMENT:	Paint cloths and covers, textured paint roller and pan, flat paddle or shaker, clean container for mixing, paint brush
MATERIALS:	Paint, water to clean latex paint, or thinner solvent to clean oil-based paint
GENERAL INSTRUCTIONS:	This activity can be used as a simulated work task in any building trades program. Students can apply skills aquired in completing specified job task at a job site. Use proper safety precautions.

PROCEDURES AND/OR TASKS:

1. Spread paint cloths and covers over floor and furniture.
2. Carefully read directions on containers.
3. Mix paint according to directions on can.

4. Pour paint into roller pan so that the pan is two-thirds full.
5. Start the roller at the shallow end of the pan and roll down into the paint several times until the roller is covered with paint.
6. The paint will absorb into the roller by rolling across the shallow end of the pan.
7. Start the roller at the top of the wall and work down the wall.
8. Use a brush to paint in the corners.
9. Handle extensions should be used for ceilings and high walls.
10. Cover each roller stroke one half of the roller width.
11. When a large area has been completed, roll side to side to help hide lap lines.
12. Clean roller and brush in warm, soapy water, if possible, when using a latex-based paint.
13. Clean roller and brush with thinner or solvent when using an oil-based paint.
14. Have instructor check work.
15. Replace tools and materials.
16. Clean work area.

STUDENT INFORMATION SHEET

PAINTING AND DECORATING

UNIT: Painting

TOPIC: Special Effects

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(E)
(e)(4)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to apply primers, special paints, and special effects correctly.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to apply special effects correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used with painting will include mathematical principles, oral and written communications, and application of reading concepts and skills.*

SPECIAL EFFECTS

The use of glaze for special effects has been around for many years. Ready-made glazes can be purchased from paint dealers. Glazes come in varying consistencies, and all have substances like wax and drying materials added to them to help hold impressions clearly and to dry faster. These glazes will usually dry to the touch in four to eight hours and will have a durable finish that will not need to be varnished, although some painters use a coat of varnish to be safe.

PAINTING WITH GLAZE

Glaze is popular to use for special effects. Glazes are used mostly to give detail and depth. By using a highly transparent thin coat of glaze, it can show the appearance of fabric or give a leather effect. When a glaze is correctly tinted, a woodgrain look can be created. Most glazes are applied over a base paint and then, by wiping off some of the glaze, will produce a textured pattern. A metal comb pulled in straight, overlapping strokes down a wall of tinted glaze will create a satin effect.

By using an off-white paint on the wall and letting it dry, then using a creamy glaze over it and using a ragging procedure, the wall will give the impression and look of parchment. When ragging the wall, you should use several soft, lint-free rags or an old sheet that can be torn up. They should be folded and held together. Press the pad of rags onto the wet glaze. Each time you do this, change directions with the pad. When the pad becomes saturated with glaze, replace it with a new one and start again.

ASSIGNMENT SHEET

PAINTING AND DECORATING

NAME:__________________________________**DATE:**____________________

UNIT:	Painting
TOPIC:	Special Effects
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(E) (e)(4)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to apply primers, special paints, and special effects correctly.
SPECIFIC OBJECTIVE(S):	After completing this assignment sheet, the student(s) will be able to apply special effects correctly.
REFERENCES:	V-2-C-IS B.T. I-Unit VI
DIRECTIONS:	Read and answer the following questions in the space provided.

1. Is the use of glaze a new process?

2. Why are wax and other materials mixed with the glaze?

3. How long does it usually take glaze to dry to the touch?

4. Glazes are used mostly to give more what?

5. What kind of appearance is produced by using a thin, transparent coat of glaze?

6. The glaze is applied over what?

7. What is produced by using a metal comb with glaze?

8. By using an off-white base and a creamy glaze, what type effect will it give?

9. What type procedure would be used to get the parchment look?

10. What type rags should be used?

JOB SHEET

PAINTING AND DECORATING

NAME:______________________________ **DATE:**____________________

UNIT: Painting

TOPIC: Splattering

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(E)
(e)(4)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to apply primers, special paints, and special effects correctly.

SPECIFIC OBJECTIVE(S): Upon completion of this lesson, the student(s) will be able to apply special effects correctly.

TOOLS AND EQUIPMENT: Brush, drop cloths, coarse-textured roller, practice wall or board

MATERIALS: Flat emulsion paint (optional to add tint or color), 1" x 2" x 12" board, 1 pint can black paint

GENERAL INSTRUCTIONS: This activity can be used as a simulated work task in any building trades program. Students can apply skills aquired in completing specified job task at a job site. Use proper safety precautions.

PROCEDURES AND/OR TASKS:

1. Spread paint cloths as needed.
2. Paint wall to be used with emulsion paint and let dry.
3. Start by dipping the brush into black paint.

4. Just cover the end of the bristles.
5. Hold 1" x 2" x 12" board in one hand and rap brush sharply against the wood.
6. The paint will flick off the brush, and spots of paint will start to show on the wall (see figure 1).

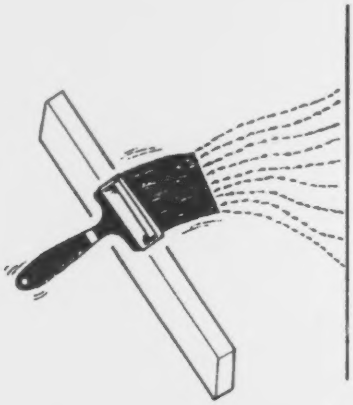


Figure 1

7. This is the fastest way of splattering for a large area.
8. If you get too much paint on wall, add more emulsion.
9. Stand back far enough so that the specs are small.
10. To make the specs smaller, use a short, stencil-type brush.
11. Stand close to the wall and flick your finger upward over the bristles in a quick movement.
12. This will make a finger splatter.
13. Have instructor check work.
14. Clean brushes.
15. Replace tools and materials.
16. Clean work area.

STUDENT INFORMATION SHEET

PAINTING AND DECORATING

UNIT: Wall Finish Techniques

TOPIC: Textures

ESSENTIAL ELEMENT(S): (a)(7)(A)
(a)(7)(C)
(a)(7)(E)
(e)(4)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to apply textures and wallcoverings correctly, and estimate their cost accurately.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to apply different types of textures.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used with wall finish techniques will include mathematical principles, oral and written communications, spelling, and reading concepts and skills.*

WHAT ARE TEXTURES?

The term *texture* refers to how wallcoatings and textures feel, or look like they feel, when they are touched. Texture can be a matter of appearance in miniprints and wallpaper patterns, which sometimes create distinct visual texture. There are many things that can be used to texture walls, such as corduroy, silk, cork, pasted leaves, flocked papers, paints, glazes, foil, cloth, straw; even polyethylene can be used to create texture for walls.

When using paints, some manufacturers use sand in the mix for a rough texture. This is good for walls with holes, cracks, and dents to help cover the surface without extensive repair work.

Burlap can be used in some rooms for a more natural appearance. This works well with a wainscoting on part of the wall.

With any texture, you need to strive for a proportion and balance. As with any accent, texture tends to draw attention to itself.

ASSIGNMENT SHEET

PAINTING AND DECORATING

NAME:__________________________________**DATE:**____________________

UNIT:	Wall Finish Techniques
TOPIC:	Textures
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(E) (e)(4)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to apply textures and wallcoverings correctly, and estimate their cost accurately.
SPECIFIC OBJECTIVE(S):	After completing this assignment sheet, the student(s) will be able to apply different types of textures.
REFERENCES:	V-3-A-IS B.T. I-Unit VI
DIRECTIONS:	Read and answer the questions in the space provided.

1. What term is used for how a wall feels and looks when touched?

2. A wall with cork on it is one type of what?

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3. Paint with sand causes a rough texture for what purpose?

4. How would wallpaper be used for texture; would you use plain paper or one with designs, and why?

5. What can be used in some rooms for a natural appearance?

6. Could straw mats be used as a wall texture?

7. Could wainscoting be used for texture in some rooms?

8. Could silk be used to texture some walls?

JOB SHEET

PAINTING AND DECORATING

NAME:___________________________________ **DATE:**_____________________

UNIT: Wall Finish Techniques

TOPIC: Applying Straw Sheeting

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(E)
(e)(4)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to apply textures and wall coverings correctly, and estimate their cost accurately.

SPECIFIC OBJECTIVE(S): Upon completion of this lesson, the student(s) will be able to apply a different type of texture correctly.

TOOLS AND EQUIPMENT: Tape measure, spreader for adhesive, utility knife or scissors, flat brush

MATERIALS: Wall adhesive, straw sheeting to cover panel or wall

GENERAL INSTRUCTIONS: This activity can be used as a simulated work task in any building trades program. Students can apply skills aquired in completing specified job task at a job site. Use proper safety precautions.

PROCEDURES AND/OR TASKS:

1. Assemble equipment and materials needed.
2. Measure wall or practice wall to be used.
3. Start at top of wall and spread adhesive the width of sheeting material.

4. Stroke the sheeting with the brush as you go down the wall.
5. Repeat steps 3 through 5 until all material is on the wall being covered.
6. After sheeting is in place, go back and trim off edge where excess was lapped over.
7. Be sure all edges are smoothed down.
8. Have instructor check work.
9. Replace tools and materials.
10. Clean work area.

STUDENT INFORMATION SHEET

PAINTING AND DECORATING

UNIT: Wall Finish Techniques

TOPIC: Wallcoverings

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(E)
(e)(4)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to apply textures and wallcoverings correctly, and estimate their cost accurately.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to apply wallcoverings correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used with wall finish techniques will include mathematical principles, oral and written communications, spelling, and reading concepts and skills.*

SPECIAL-TYPE COVERINGS

For special coverings, you can consider using grasscloth, linens, burlap, even shiny pebbles and stones. With all these different materials, we can design and make whatever we want on our walls to create the style and character we want.

Before installing these special-type covers, we need to be aware that the cloth and other materials may be a problem to clean. Special-type coverings are sometimes hard to hang in place on the wall and somewhat difficult to cut when wet. Seams can be a problem if a seam roller is used. Special coverings provide you with many alternatives and unique opportunities to do something different.

CORK VENEER

The brown tones and variegated texture of cork is good to use in recreation rooms, dens, or family rooms. You can purchase thick all-cork panels or a veneer-cork in sheets that are very thin. These are carefully shaved from cork planks and laminated onto a plain backing. If you use cork, it can be installed without worrying about matching the design or pattern. The veneer should be hung over lining paper. One sheet at a time, it should be trimmed, pasted, and hung. If more than one is done, they may soak through, and the cork could possibly separate from the backing.

GRASSCLOTH

This type wallcovering is available in the natural materials as well as synthetic and is more formal than the cork. Because of the pattern being indistinct, it reduces problems in matching. Roll to roll variations in color are inevitable. When hanging, never paste and set aside grasscloth coverings. Like other veneer-type coverings, the grasscloth is usually laminated to paper and may separate from the backing. The burlap- and hemp-type coverings are similar to the grasscloth.

OTHER TYPES OF MATERIALS

There are many other types of materials used for wallcoverings. Some of the different types are linen, embossed, polyvinyl, strawpaper, animal hides, felt, suedecloth, and pasted leaves; all of which can be used to create decorative effects. These types of coverings help to disguise flaws in walls and help to insulate walls and soundproof rooms. The only problem with the materials is the wearability of the material being used when cleaning needs to be done. Most of these coverings are expensive and are sometimes hard to handle.

PATTERNED SHEETS

Some bedsheets with designs and solid colors are being used for wall coverings. The patterned sheets are the cheapest fabric wallcoverings available. Often, a single king-sized sheet can cover nine square feet of wall. The patterns are sometimes difficult to match; therefore, you should plan carefully before hanging patterned sheets. The sheets are well-suited for stapling. Padding the wall first with polyester batting gives sheeting a softer look and helps to soundproof the walls.

ASSIGNMENT SHEET

PAINTING AND DECORATING

NAME:____________________________________DATE:______________________

UNIT:	Wall Finish Techniques
TOPIC:	Wallcoverings
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(E) (e)(4)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to apply textures and wallcoverings correctly, and estimate their cost accurately.
SPECIFIC OBJECTIVE(S):	After completing this assignment sheet, the student(s) will be able to apply wallcoverings correctly.
REFERENCES:	V-3-B-IS B.T. I-Unit VI
DIRECTIONS:	Read and answer the following questions in the space provided.

1. Special-type coverings are ___________ to clean.

   A. easy
   B. hard
   C. washed
   D. steamed

2. Sometimes seams are a problem if a(n) ___________ is used.

   A. iron roller
   B. steam roller
   C. seam roller
   D. none of the above

3. With brown tones, ___________ is good to use in a den or recreation room.

A. grasscloth
B. cork
C. linen
D. burlap

4. When using cork, you do not have to worry about the ___________.

A. color contrast
B. design and pattern
C. separation
D. thickness

5. You should never do more than ________ piece(s) at one time with paste.

A. two
B. one
C. three
D. as many as you want

6. If a veneer-type covering sets too long after paste is applied, it will ___________.

A. get hard
B. start to curl
C. stretch
D. separate

7. The burlap and hemp coverings are similar to the ___________.

A. linen
B. cork
C. strawpaper
D. grasscloth

8. The grasscloth is available in natural material as well as __________ materials.

A. colored
B. embossed
C. polyvinyl
D. synthetic

9. Special-type coverings let you ___________ your own wallcovering.

A. hang
B. design
C. clean
D. use

10. Special-type coverings help to ___________ flaws on walls.

A. disguise
B. improve
C. color
D. none of the above

JOB SHEET

PAINTING AND DECORATING

NAME:________________________________ **DATE:**____________________

UNIT:	Wall Finish Techniques
NAME OF JOB:	Installing Cork on Wall
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(E) (e)(4)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to apply textures and wallcoverings correctly, and estimate their cost accurately.
SPECIFIC OBJECTIVE(S):	After completing this lesson, the student(s) will be able to apply wallcoverings correctly.
TOOLS AND EQUIPMENT:	Tape measure, sharp utility knife
MATERIALS:	Panel adhesive, 32 pieces of 12" square cork panels
GENERAL INSTRUCTIONS:	Installing cork makes a very good bulletin board and helps soundproof walls. These panels can be glued and stuck in place. This can be done on 4′ x 8′ sheet of 1/4" plywood and installed where needed.

PROCEDURES AND/OR TASKS:

1. Collect materials needed to complete this task.
2. Clean wall; be sure dust and dirt are removed.
3. Use caulk gun and tube of adhesive.
4. Mark wall with pencil where you want to start with the cork panel.

5. Place a bead of adhesive about 1" to the inside edge on back of each panel; do one panel at a time.

6. Let adhesive dry for a few seconds till it is tacky; then fit in place.

7. Continue repeating steps 5 and 6 until all the panels are in place.

8. This will make a 4′ x 8′ bulletin board for school, recreation room, or for a room at home.

9. After completion, have instructor check work.

STUDENT INFORMATION SHEET

PAINTING AND DECORATING

UNIT: Wall Finish Techniques

TOPIC: Estimating

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(E)
(e)(4)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to apply textures and wallcoverings correctly, and estimate their cost accurately.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to estimate wall finish correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used with wall finish techniques will include mathematical principles, oral and written communications, spelling, and reading concepts and skills.*

ESTIMATING NEEDS

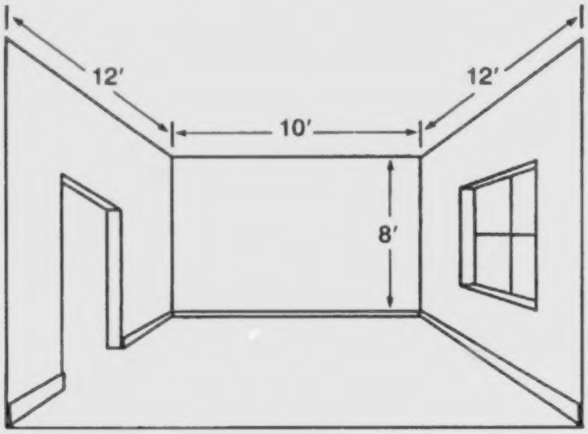
To consider how much wallcovering we need, we will have to understand that most manufacturers' dyes will vary somewhat between lot runs. There is also the chance of damaging a strip or two while putting on paste and handling. There are stairway walls and other areas that will use more covering than you realize. If you order extra rolls and have some left over that are not open, most dealers will let you return them. You may want to keep some in case of any repairs that may come up.

If you make your own estimate, be sure to measure the length around your room (wall + wall + wall + wall = perimeter), and then multiply by the height from baseboard to ceiling break. Then divide by 30". Most rolls have 36 square feet; by using 30, this lower number will allow for damage and waste for the approximate number of single rolls. Subtract one roll for each pair of standard doors or double-width windows. If you have any unusual spaces or extra long patterns, you need to add one roll.

TO ESTIMATE NEEDS

To find out how much paper or wall covering you will need, the drawing in Figure 1 will show you how to do the estimate.

Figure 1



10′ + 10′ + 12 ′ + 12′ = 44 x 8 = 352 ÷ 30 = 11.7 = 12 rolls
Subtract 1 for door and windows = 11 rolls

When you have estimated your room size and have the distance around the room, the chart in Figure 2 will show you a quick and easy way to calculate how many rolls of paper you will need. You should check with the dealer on your measurements and amount of rolls needed.

Figure 2

CHART FOR SINGLE STANDARD ROLLS

Distance around room in feet	Single rolls for room with			Single rolls for ceiling
	8-foot walls	9-foot walls	10-foot walls	
36	9	10	11	3
40	10	11	13	4
44	11	12	14	4
48	12	14	15	5
52	13	15	16	6
56	14	16	17	6
60	15	17	19	7
64	16	18	20	8
68	17	19	21	9
72	18	21	22	10

ASSIGNMENT SHEET

PAINTING AND DECORATING

NAME:______________________________________**DATE:**_______________________

UNIT: Wall Finish Techniques

TOPIC: Estimating

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(E)
(e)(4)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to apply textures and wallcoverings correctly, and estimate their cost accurately.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will be able to estimate wall finish correctly.

REFERENCES: V-3-C-IS

DIRECTIONS: Read and answer the following questions in the space provided.

1. Why would you not order just enough covering to do the job?

2. If you have rolls left that are not open, what should you do?

3. How many rolls would you subtract for standard doors and windows?

4. What would you measure to find out how many feet the perimeter is?

5. If you know the room size, what could you use to calculate the number of single rolls needed?

JOB SHEET
PAINTING AND DECORATING

NAME:______________________________**DATE:**__________________

UNIT:	Wall Finish Techniques
NAME OF JOB:	Estimating Wallcovering
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(E) (e)(4)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to apply textures and wallcoverings correctly, and estimate their cost accurately.
SPECIFIC OBJECTIVE(S):	Upon completion of this lesson, the student(s) will be able to identify and state the purpose of estimating wallcovering correctly.
TOOLS AND EQUIPMENT:	12" ruler or scale
MATERIALS:	Paper, pencil
GENERAL INSTRUCTIONS:	Using a different room size than in Figure 1, use the formula and figure how much wallcovering is needed.

PROCEDURES AND/OR TASKS:

1. Assemble materials needed.
2. Use dimensions for room size given by the instructor.
3. Draw the room, and label as shown in Figure 1.
4. Calculate the amount of wallcovering needed.

APPENDIX V-A

FORMULA FOR PAINT

Measure the length and width of the room and compute the perimeter.

Multiply the room perimeter by its height to get the total wall area in square feet.

Subtract 21 square feet per door, 15 square feet per normal window.

Divide this figure by the square feet covered by a typical gallon of paint. Coverage varies from one manufacturer to another; this will give you the gallons you will need.

FORMULA FOR WALLCOVERING

Measure the length around your room (wall + wall + wall + wall = perimeter); then, multiply by the height from baseboard to the ceiling break.

Divide by 30 (most rolls are 36 square feet, but using the smaller number allows for damage and waste) to determine the number of single rolls. Subtract one roll for standard door and/or double windows. You may need to add a roll for unusual spaces or long pattern repeats.

APPENDIX V-B

GLOSSARY

Abrasive paper--Used to smooth surfaces before painting and to roughen gloss on paint before painting over it.

Acrylic--A resin used to bind pigment, water, and ingredients in latex paint.

Alkali--A substance, found in masonry surfaces, which tends to leak through coatings of paint.

Alkyd--oil-based paint made with a synthetic resin. Interior oil-based paints today are alkyd.

Back tacking--The technique to mount fabric wallcovering where the material is folded back over upholstery tape and stapled.

Binder--An ingredient that holds together components of paint. Both water- and oil-based paints use resins for binding. The more resin, the more durable the paint.

Bolt--The package that wallpaper is sold in.

Booking--Technique of folding pasted wallpaper strips face to face.

Border--A narrow strip of wallcovering used around doors, ceilings, windows.

Butted seam--Where wallpaper meets and does not overlap edges.

Calcimine--A water-based paint used for ceilings.

Caulking--A flexible filler to fill open joints.

Ceiling paint--A thick, flat coating made for ceilings which is sometimes tinted to reduce glare.

Ceiling break--Where top of the wall meets the ceiling.

Chair rail--A decorative wall molding about 30 inches from the floor.

Color run--A dye bar, or run number, of a batch of wallcovering rolls printed at the same time.

Cornice--A horizontal molding at the top of the wall.

Cutting in--Painting the edges of the ceiling or wall area.

Cutting wheel--A tool to cut wallpaper; a sharp, spinning wheel on the end of a handle.

Dado--Space on wall between the top of the baseboard and the chair rails.

Embossed paper--Wallpaper with a raised design creating a pattern.

Enamel--A paint that dries with a glossy or semigloss finish.

Enamel undercoat (oil-based)--A primer coating characterized by the degree of tooth; because of the porosity, it better absorbs moisture.

Epoxy--A plastic paint that dries by chemical reaction to an extremely hard surface.

Feathering--To thin the outer edge with a dry brush or by sanding.

Flocked paper--Wallpaper made by shaking crushed rayon or nylon onto a design made with a slow-drying paint.

Glaze--A mixture of oil and mineral spirits, usually tinted when applied, used to achieve special painting effects.

Gloss--A shininess that has a capacity for reflecting light.

Lapped seam--A seam between two wallpaper strips created by overlapping the edges.

Latex--A paint whose resins, pigments, and ingredients are suspended in water.

Lining paper--Used under certain wallcoverings to provide a smooth surface and better paste absorption.

Masking--Shielding an area from paint usually with tape.

Mildew--A fungus that grows in high moisture areas and can stain or mar finishes.

Mineral spirits--Petroleum-based paint thinner.

Mural--A wallcovering with a number of strips portraying a single subject.

Muriatic acid--A diluted form of hydrochloric acid used to clean alkali deposits from masonry. Muriatic acid is a dangerous substance.

Patching compound--A plastic-like material used to patch or fill holes and cracks in plaster.

Pattern match--The alignment of designs on wallcovering.

Pattern repeat--A number of vertical inches between identical parts in a wallcovering.

Polyurethane--A durable, clear, plastic finish used for trim, floors, and other types of woodwork.

Pouncing--A technique of dispersing paint by repeatedly flexing it against a surface. This is used in obtaining a marbling effect.

Prepasted paper--Wallcovering with adhesive already coated on the back.

Pretrimmed paper--Wallcovering whose selvage has been trimmed at the factory.

Primer--A gritty undercoat designed to help finish paint adhere and cover. There are latex and oil-based primers.

Plumb line--A weighted line used to establish a true vertical on the wall.

Putty knife--A spatula used for applying patching compounds and scraping wood.

Railroading--Installing wallcovering horizontally rather than vertically.

Resins--The prime binding agents for most modern paints.

Seam--A line formed by the edges of wallcoverings.

Seam roller--A tool made of hard rubber or wood rollers to flatten the edges of wallcovering.

Selvage--A blank strip along the edge of wallpaper. The selvage must be trimmed before paper can be hung.

Shellac--A glossy, clear finish made by dissolving in alcohol the resinous secretions of scale insects.

Single roll--A basic unit used in pricing wallpaper. Most single rolls are 36 square feet of wallcovering.

Sizing--An undercoating and sealer used with wallpaper.

Solvent--A liquid used to dissolve or thin paint to improve flow of application.

Stipping--Blending fresh paint with an older coat to match the texture of a patch to that of the surrounding wall.

Straight edge--A metal guide used to trim and cut wallcovering.

Strip--A length of wallpaper that is trimmed to fit between baseboard and the ceiling.

Strippable paper--Wallcovering that can be removed by pulling it off the wall.

Trisodium phosphate (TSP)--A water-soluble cleaning agent useful in degreasing walls and in other heavy cleanup.

Turpentine--A thinner, like mineral spirits, but made from pine trees.

Varnish--A transparent finish, mostly used on natural wood surfaces.

Vinyl--A plastic wallpaper usually backed with cloth or paper.

STUDENT INFORMATION SHEET

PLUMBING

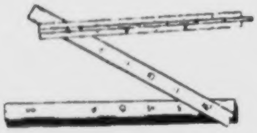
UNIT:	Plumbing Tools and Materials
TOPIC:	Plumbing Tools
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(5)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to use plumbing tools and materials when correctly installing plumbing fixtures.
SPECIFIC OBJECTIVE(S):	After completing this information sheet, the student(s) will be able to use plumbing tools correctly.
BASIC ACADEMIC SKILLS APPLICATION:	*Basic academic skills used with plumbing tools and materials will include application of reading concepts and skills and oral and written communications.*

PLUMBING TOOLS

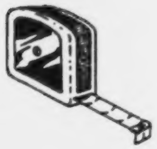
As craftsworkers, plumbers should be able to identify correctly and know how to take care of the tools they will work with. Using quality tools makes the work being done much easier and faster.

A description, along with pictures of some of the tools used in plumbing, will help you recognize and choose the right tools necessary to do the job correctly.

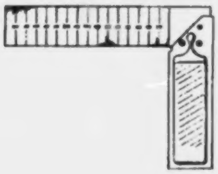
1. **Plumber's folding rule** has a vertical inch marking at the top and a 45° scale at the bottom.



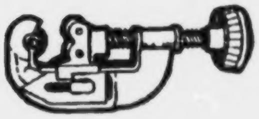
2. **Steel tape measure** with a hook on end is commonly used, and sometimes 100 foot lengths are used to locate terminal points.



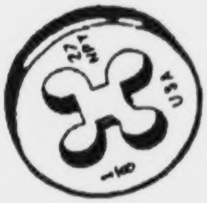
3. **Try squares** are used for marking and cutting.



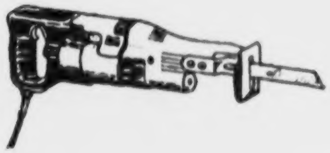
4. **Tubing cutters** are small cutters used mostly to cut copper tubing.



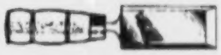
5. **Pipe dies** are used to make threads on the outside ends of pipe.



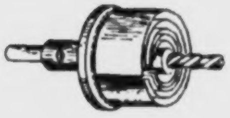
6. **Variable speed sawzall** will cut through three-inch material, which is more than most saws can accomplish.



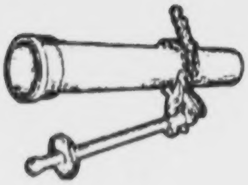
7. **Wood chisel** is to be used with a mallet to notch joists and studs.



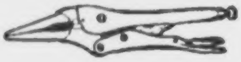
8. **Hole saws** are used for running pipe through flooring and walls, and most are used with electric drills.



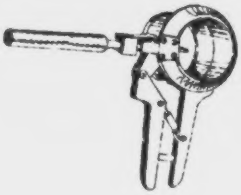
9. **Soil pipe cutters** have a cutter in each link and are used to cut cast-iron pipe.



10. **Locking pliers** is a multipurpose tool which has tremendous clamping pressure.



11. **Plastic pipe cutter** and **beveler** cuts plastic pipe straight and bevels the edges. It will cut pipe 1 1/2" to 4".



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ASSIGNMENT SHEET
PLUMBING

NAME: ______________________________ **DATE:** ____________________

UNIT: Plumbing Tools and Materials

TOPIC: Plumbing Tools

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(5)

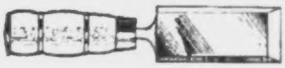
UNIT OBJECTIVE: After completing this unit, the student(s) will be able to use plumbing tools and materials when correctly installing plumbing fixtures.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will be able to use plumbing tools correctly.

REFERENCE:
VI-1-A-IS
B.T. I--Unit VII

DIRECTIONS: Identify each of the plumbing tools shown in the picture, and describe the purpose of each tool.

1.



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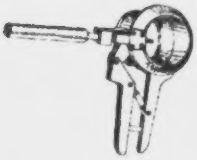
PURPOSE:

2.



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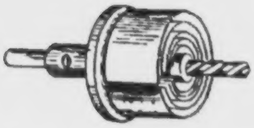
PURPOSE:

3.



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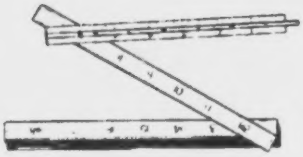
PURPOSE:

4.



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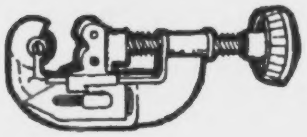
PURPOSE:

5.



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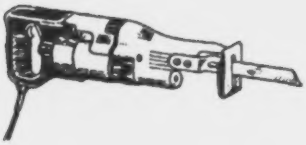
PURPOSE:

6.



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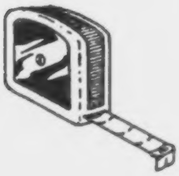
PURPOSE:

7.



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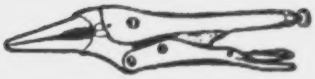
PURPOSE:

8.



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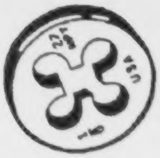
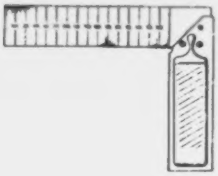
PURPOSE:

9.



PURPOSE:

10.



PURPOSE:

JOB SHEET

PLUMBING

NAME ______________________________ **DATE** ____________________

UNIT: Plumbing Tools and Materials

NAME OF JOB: Cutting a Soil Pipe

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(5)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to use plumbing tools and materials when correctly installing plumbing fixtures.

SPECIFIC OBJECTIVE(S): Upon completion of this lesson, the student(s) will be able to cut soil pipe correctly

TOOLS AND EQUIPMENT: Chisel, hammer, grease pencil, 12′ steel tape, 2" x 4" x 6" board

MATERIALS: 2-foot section of heavy pipe; instructor to furnish pipe that can be obtained from a plumber or contractor.

GENERAL INSTRUCTIONS: By following these procedures, a student will be able to cut a piece of soil pipe on the job with tools on hand. This can be practiced and completed in shop.

PROCEDURES AND/OR TASKS:

1. Assemble tools necessary per job sheet.
2. Lay out section of pipe on shop floor.
3. Use steel measuring tape to measure 12" on pipe.

4. Use grease pencil to mark where it is to be cut.
5. Turn pipe, and measure at different places until pipe is marked completely around. This ensures that cut will be straight.
6. Use chisel, and set cutting edge on line marked.
7. With a hammer, tap chisel lightly; then rotate the pipe, and repeat until you have gone completely around pipe. Repeat until you have a 1/16" groove around pipe.
8. Lay piece of 2" x 4" under pipe close to where the pipe has been marked.
9. Holding one end of pipe down, bump the end close to the place cut with a hammer, rotating pipe as you go around. It will then break off evenly.
10. Have instructor watch and check your work when you have finished.

STUDENT INFORMATION SHEET

PLUMBING

UNIT: Plumbing Tools and Materials

TOPIC: Plumbing Materials

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(5)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to use plumbing tools and materials when correctly installing plumbing fixtures.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to use plumbing materials correctly.

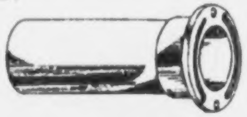
BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used with plumbing tools and materials will include application of reading concepts and skills and oral and written communications.*

PLUMBING MATERIALS

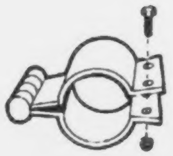
There are different materials plumbers use and must be able to recognize to work in residential and light commercial plumbing.

A description, along with pictures of some of these materials used in plumbing, will help you recognize and choose the right materials for the job.

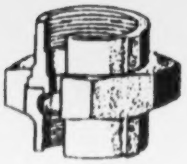
1. **Closet flange** is used to connect the water closet to the drainage pipe.



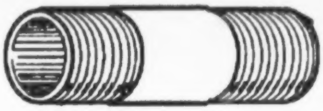
2. **Repair clamps** are made to strap around pipes to stop small leaks.



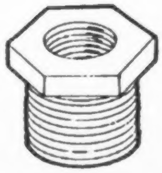
3. **Unions** may have differently-shaped joint surfaces. On one end it's shaped like a ball, and the other is shaped to fit over it; the two are held together by a threaded collar.



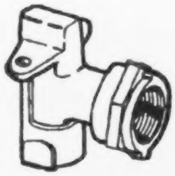
4. **Nipples** are short pieces of pipe usually threaded on both ends.



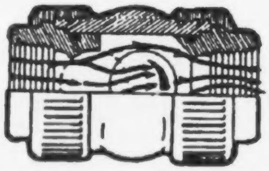
5. **Bushings** compensate for the difference in diameter when smaller pipes must be connected to larger fittings.



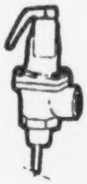
6. **Meter stop valves** are to be used between the water supply and the meter at a residence.



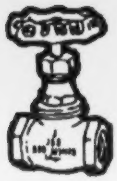
7. **Ball valve** (one type shown) is used to reduce water pressure in a building and is spring-loaded. The valve remains open until a set pressure is reached; then it will close. As the pressure drops, the valve will begin to open.



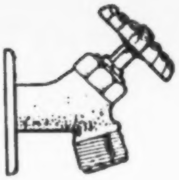
8. **Pressure relief valve** is used for hot water heaters. Excessive pressure will let the valve bleed off gases and evaporate as needed.



9. **Gate valve** is operated by a disk that slides across the opening to stop the flow and then open it again.



10. **Compression faucet** is usually installed in laundry rooms. This style is made to fit flush against the wall.



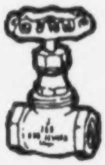
ASSIGNMENT SHEET

PLUMBING

NAME:	______________________________________	**DATE:**	____________________

UNIT:	Plumbing Tools and Materials
TOPIC:	Plumbing Materials
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(5)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to use plumbing tools and materials when correctly installing plumbing fixtures.
SPECIFIC OBJECTIVE(S):	After completing this assignment sheet, the student(s) will be able to use plumbing materials correctly.
REFERENCE:	VI-1-B-IS B.T. I--Unit VII
DIRECTIONS:	Identify each of the following materials shown and state the purpose of each.

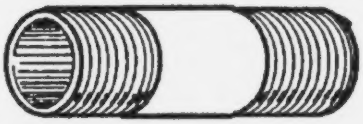
1.



____

PURPOSE:

2.



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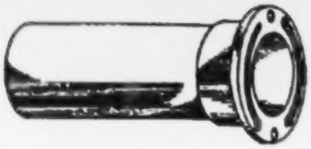
PURPOSE:

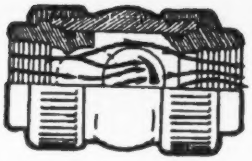
818

3.



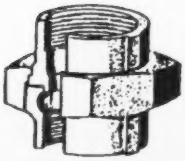
PURPOSE:

4.



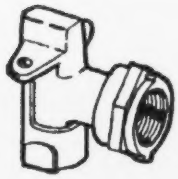
PURPOSE:

5.



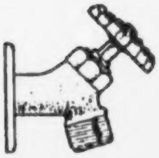
PURPOSE:

6.



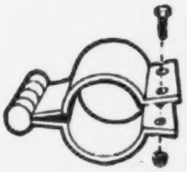
PURPOSE:

7.



PURPOSE:

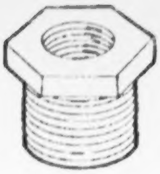
8.



PURPOSE:

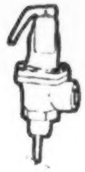
819

9.



PURPOSE:

10.



PURPOSE:

JOB SHEET

PLUMBING

NAME ______________________________ **DATE** ____________________

UNIT:	Plumbing Tools and Materials
NAME OF JOB:	Union Installation
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(5)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to use plumbing tools and materials when correctly installing plumbing fixtures.
SPECIFIC OBJECTIVE(S):	Upon completion of this lesson, the student(s) will be able to install a union correctly.
TOOLS AND EQUIPMENT:	Pipe threader, union, pipe cutter, vise, oil, 2 pipe wrenches, folding ruler
MATERIALS:	Length of steel pipe (1/2- or 3/4-inch diameter), pipe sealer.
GENERAL INSTRUCTIONS:	Steel pipe is available in different lengths. However, the plumber usually has to cut the pipe to a desired length. This installation can be accomplished by the following steps.

PROCEDURES AND/OR TASKS:

1. With a folding ruler, measure 12" length of pipe to be cut.
2. Use marking pencil to mark desired length.

3. Place pipe in vise 4" from the mark and tighten vise.
4. Place pipe cutter on pipe until cutting wheel is snug.
5. Rotate cutter.
6. Tighten cutter handle after each turn.
7. Use reamer to clean burr out of pipe ends.
8. Using pipe threader, pat one end of pipe still in vise.
9. Put a small amount of oil on pipe where threaders are located.
10. Rotate threader until 1" of threads is on pipe; then remove threads.
11. Use pipe compound on threads.
12. Disassemble union, and screw one end on pipe with pipe wrench until tight.
13. Go through same steps with other pipe.
14. Slip threaded collar over pipe, and screw other end of union on pipe until tight.
15. Holding the ends of the union together, start collar on threads and tighten.
16. Clean and store tools properly.
17. Clean work area.

STUDENT INFORMATION SHEET
PLUMBING

UNIT:	Plumbing Tools and Materials
TOPIC:	Plumbing Fixtures
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(5)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to use plumbing tools and materials when correctly installing plumbing fixtures.
SPECIFIC OBJECTIVE(S):	After completing this information sheet, the student(s) will be able to install plumbing fixtures correctly.
BASIC ACADEMIC SKILLS APPLICATION:	*Basic academic skills used with plumbing tools and materials will include application of reading concepts and skills and oral and written communications.*

PLUMBING FIXTURES

It is the plumber's responsibility to install plumbing fixtures. You should become familiar with different fixtures used in residences and businesses.

DISPOSALS

The food left over from meals, such as vegetables and other items that are not hard, can be put in the opening of the garbage disposal that is attached to the bottom of the sink. When the disposal is turned on, it will shred these materials, and they can be washed down the drain and through the wastewater system. Disposals are used mostly in homes, restaurants, and cafeterias. (See TM-1.)

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FLUSH VALVES

These valves operate by pressing down on the handle to release the water, allowing it to flow through water closets and urinals. They are mostly used in commercial buildings, schools, and recreational areas.

WATER FOUNTAINS

Water fountains are found in various places such as parks, schools, and commercial buildings. Water fountains are installed for the convenience of the people visiting or working in these areas.

When the handle or lever of the water fountain is turned or pressed, water comes through the lines permitting someone to drink. (See TM-1.)

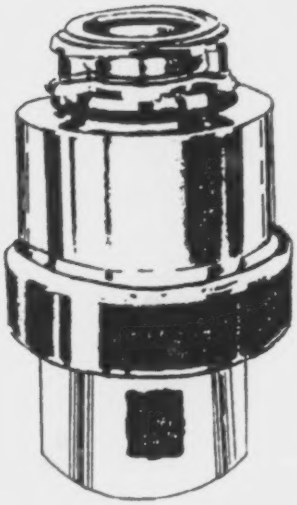
MATERIALS FOR FIXTURES

Plumbing fixtures are made from various materials. The most commonly used materials are vitrified porcelain, stainless steel, acrylic plastic, fiberglass reinforced with plastic, and cast iron.

Porcelain used to coat cast iron or steel makes a sanitary and easily cleaned surface. Porcelain is made from silica, quartz, feldspar, and fine clay. The most expensive type of porcelain is vitrified porcelain, also called china or vitreous china. These types require a very high temperature to fuse the materials.

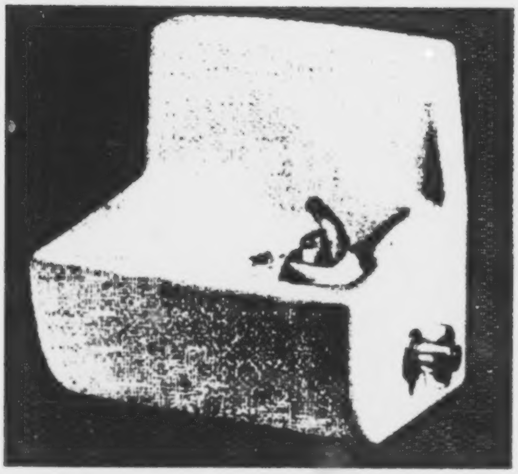
Plastics are versatile and inexpensive and can be shaped to form nearly any fixture, such as bath and shower combinations formed as one unit. Cabinets and other accessories can be made of plastic and formed into one unit, making the cost of remodeling much less expensive.

Gray iron is very good for plumbing fixtures because of the cast, and can be cast in a wide variety of shapes. Porcelain enamels are fused to the gray iron, providing a protective sanitary coating and adding a glossy decorative appearance.



DISPOSAL

FOUNTAIN



TM-1

VI-1-C-AS

ASSIGNMENT SHEET

PLUMBING

NAME: ______________________________ **DATE:** ____________________

UNIT: Plumbing Tools and Materials

TOPIC: Plumbing Fixtures

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(5)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to use plumbing tools and materials when correctly installing plumbing fixtures.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will be able to install plumbing fixtures correctly.

REFERENCE:
VI-1-C-IS
B.T. I--Unit IV

DIRECTIONS: Read and answer each of the following questions in the space provided.

1. What is the garbage disposal used for?

2. How are disposals installed?

3. The water closets and urinals are operated with what?

4. Where is the water fountain usually installed?

5. What operates the disposal?

6. How is a flush valve operated?

7. How does the water fountain work?

8. Why would we only put materials that are not hard in a disposal?

9. Where would we find garbage disposals installed?

10. Who installs the garbage disposal?

JOB SHEET
PLUMBING

NAME ______________________________ DATE ____________________

UNIT:	Plumbing Tools and Materials
NAME OF JOB:	Install A Dishwasher
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(5)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to use plumbing tools and materials when correctly installing plumbing fixtures.
SPECIFIC OBJECTIVE(S):	Upon completion of this lesson, the student(s) will be able to install a dishwasher correctly.
TOOLS AND EQUIPMENT:	Air-acetylene torch, striker, gas tank, tank wrench, solder, flux, sand cloth, adjustable wrench, flaring tool and block, flare nut wrench, level, screwdriver, 1/2" tubing cutter, 6' rule or steel tape
MATERIALS:	Dishwasher, 1 1/2" tubing, 1/2" tubing, fittings and valves, dishwasher adapter sink tail piece, clean cloth
GENERAL INSTRUCTIONS:	This activity can be used as a simulated work task in any building trades program. Student(s) can apply skills aquired in completing specified work task at a job site. Use blueprint provided by instructor to locate where dishwasher is to be installed. Use proper safety precautions.

PROCEDURES AND/OR TASKS:

1. Assemble tools, equipment, and material needed.
2. Be sure to check manufacturer's specifications before proceeding.
3. Remove cover from front of dishwasher using a screwdriver.
4. Place dishwasher in position in the cabinet.
5. Locate the water inlet and outlet on dishwasher.
6. Using adjustable wrench, install unions on inlet and outlet connections.

   CAUTION: Dishwasher must be disconnected in order to be removed easily.

7. Shut off hot water supply to kitchen sink and drain the line.
8. Cut into hot water line under sink and install tee and valve to dishwasher.
9. Run line from valve to water inlet on dishwasher and solder all connections. Check the manufacturers' specifications.
10. Remove tail piece from sink drain nearest dishwasher and replace with dishwasher adapter tail piece using a spud wrench.
11. Measure and cut 1/2" copper tubing to fit from drain union to the dishwasher adapter tail piece on sink drain.
12. Check manufacturers' specifications for the drain loop to prevent sink back up into dishwasher.
13. Clean and flux all connections.
14. Install the tubing and solder all connections.
15. Turn water on and check for leaks.
16. Have electrician connect electricity in order to check all the connections.
17. Check manufacturers' instructions for securing dishwasher to the cabinet and leveling legs.
18. Replace the front cover.
19. Have instructor check work.
20. Replace tools and material.
21. Clean work area.

JOB SHEET
PLUMBING

NAME ______________________________ **DATE** ____________________

UNIT: Plumbing Tools and Materials

NAME OF JOB: Repair a Shower Valve

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(5)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to use plumbing tools and materials when correctly installing plumbing fixtures.

SPECIFIC OBJECTIVE(S): Upon completion of this lesson, the student(s) will be able to repair a shower valve correctly.

TOOLS AND EQUIPMENT: Adjustable wrench, screwdrivers, plumber's socket wrench set, valve seat wrench, knife, handle puller

MATERIALS: Pipe compound, clean cloth, stem grease, valve seat (new), washer (new)

GENERAL INSTRUCTIONS: This activity can be used as a simulated work task in any building trades program. Student(s) can apply skills aquired in completing specified work task at a job site. Use proper safety precautions.

PROCEDURES AND/OR TASKS:

1. Assemble tools, equipment, and materials needed.
2. Cut off water supply to valve.

3. Remove the valve handle with handle puller.
4. Remove escutcheon.
5. Loosen the valve bonnet with socket wrench and remove valve stem assembly.
6. Remove and replace valve seat using the valve seat wrench.
7. Remove the washer on the end of the stem using knife tip.
8. Replace the washer using a screwdriver.
9. Reassemble valve using pipe compound to lubricate threads.
10. Tighten packing nut using adjustable wrench.
11. Apply stem grease to stem.
12. Replace escutcheon and valve handle.
13. Wipe valve and adjacent area with clean cloth.
14. Have instructor check work.
15. Replace tools and materials.
16. Clean work area.

STUDENT INFORMATION SHEET

PLUMBING

UNIT:	Fundamentals of Plumbing
TOPIC:	Symbols and Sketches
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(5)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to interpret symbols and sketches correctly when repairing drainage and water systems.
SPECIFIC OBJECTIVE(S):	After completing this information sheet, the student(s) will be able to read and interpret plumbing symbols and sketches correctly.
BASIC ACADEMIC SKILLS APPLICATION:	*Basic academic skills used with fundamentals of plumbing will include mathematical principles, oral and written communications, and application of reading concepts and skills.*

SYMBOLS AND SKETCHES

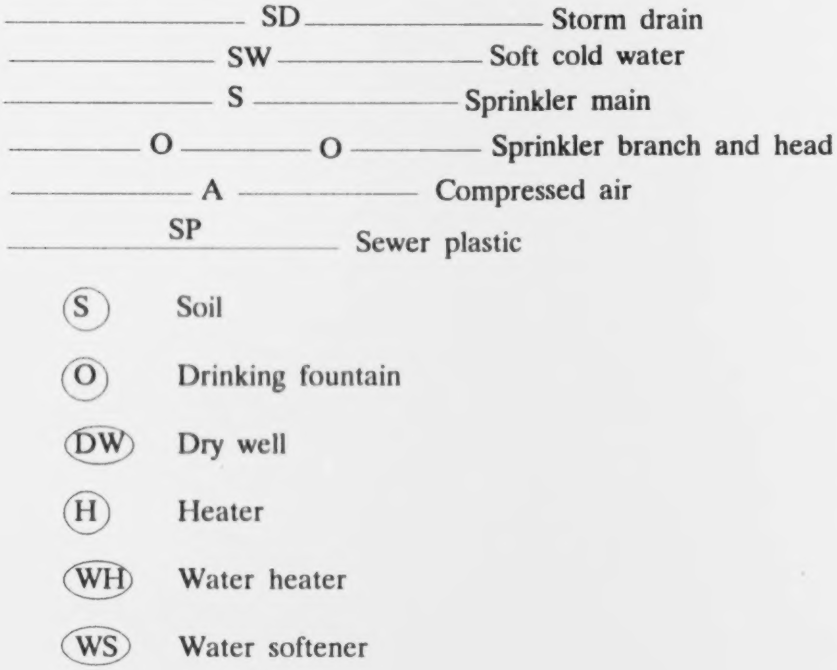
Most plans for residential structures do not show piping on the drawings. Plumbers will need to be able to sketch piping in order to install it and to communicate with other workers. These sketches should be made on isometric grid paper. Using line and fixture symbols, the drainage system should be separated from the water system on such a sketch. (See TM-2.)

Another sketch, the isometric, shows a drawing of residential DWV and water supply. (See TM-2.)

SYMBOLS

The architect uses symbols, as you would use the alphabet, to describe what size, shape, and materials to use in a building project. Symbols are much easier than drawing a picture of materials to be used and the location of various fixtures. The symbols and abbreviations used on blueprints save time and space and are common plumbing abbreviations. (See Figure 1.)

Figure 1 Plumbing Symbols

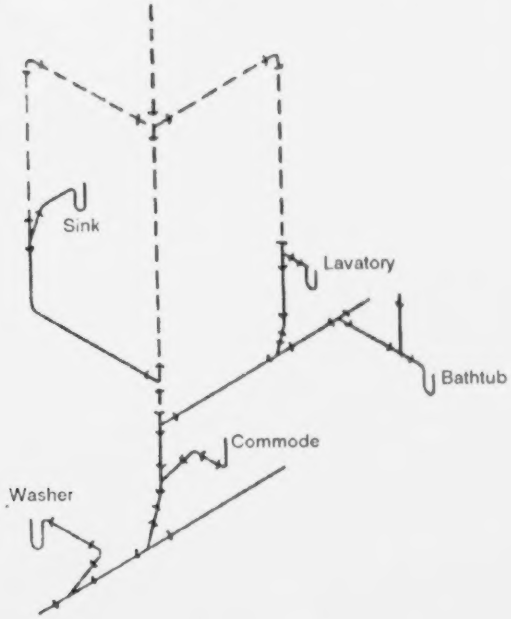

SD Storm drain
SW Soft cold water
S Sprinkler main
O O Sprinkler branch and head
A Compressed air
SP Sewer plastic
S Soil
O Drinking fountain
DW Dry well
H Heater
WH Water heater
WS Water softener

SKETCHES

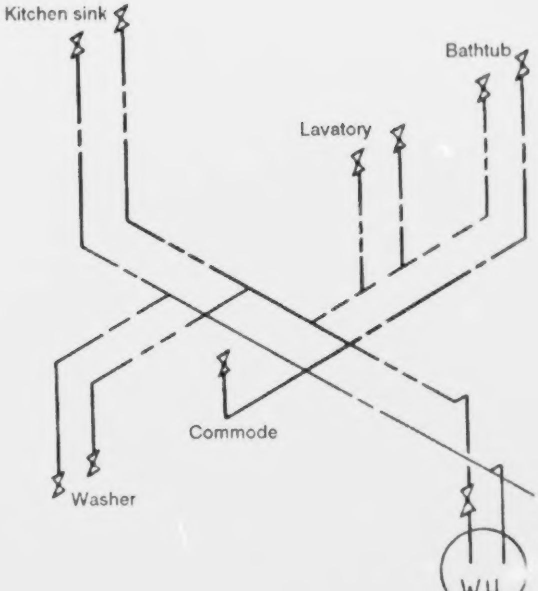
Plumbers make sketches because residential plans do not include pipe drawings. Plumbers need to develop skills in sketching piping installation. This sketching can be done on the back of plans, in a note pad, or on other paper. It is important that workers can understand what needs to be done.

Isometric sketches are used for complicated piping systems. When making an isometric sketch, it is helpful to remember vertical pipes are always drawn vertically, and horizontal pipes are drawn at 120° angle to the vertical line. The preprinted isometric grid paper is best used in making isometric sketches. The 1/4"=1' 0" scale should be used and checked on the sketches made by construction employees to ensure measurements are correct.

DWV SYSTEM


Sink
Lavatory
Bathtub
Commode
Washer

WATER SYSTEM


Kitchen sink
Bathtub
Lavatory
Commode
Washer
W.H.

TM-2

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ASSIGNMENT SHEET

PLUMBING

NAME: ______________________________ **DATE:** ____________________

UNIT: Fundamentals of Plumbing

TOPIC: Symbols and Sketches

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(5)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to interpret symbols and sketches correctly when repairing drainage and water systems.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will be able to read and interpret plumbing symbols and sketches correctly.

REFERENCE:
VI-2-A-IS
B.T. I--Unit VII

DIRECTIONS: Choose the correct response to complete each statement.

1. Most plans for residential structures do not show ______________ on the drawing.

   A. electrical
   B. piping
   C. wall framing
   D. foundations

2. The ______________ symbol is used on drawings to show soft cold water.

   A. ——SD——
   B. ——S——
   C. ——SW——
   D. S-P

3. The ______________ symbol is used when a water heater is shown on sketches and drawings.

   A. S
   B. O
   C. DW
   D. WH

4. The measurement system normally used is ______________ on plans and drawings.

   A. 1/5"=1'-1"
   B. 1/4"=1'-0"
   C. 1/8"=1'-0"
   D. 1/2"=1'-0"

5. The DWV sketch would be used to show a(n) ______________ system to be used with drawings.

   A. water piping
   B. electrical
   C. drain piping
   D. heat piping

6. You have 542 lineal feet of plastic pipe, and you need 1,702 lineal feet to complete the job. How many more lineal feet will you need?

   ________ lineal feet.

JOB SHEET

PLUMBING

NAME ________________________________ **DATE** ____________________

UNIT: Fundamentals of Plumbing

NAME OF JOB: Isometric Sketching

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(5)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to interpret symbols and sketches correctly when repairing drainage and water systems.

SPECIFIC OBJECTIVE(S): Upon completion of this lesson, the student(s) will be able to read and interpret plumbing symbols and sketches correctly.

TOOLS AND EQUIPMENT: Drawing board, 45° triangle (8" sides), 30° x 60° triangle (10" sides), pencil, eraser, pencil sharpener, architect's scale

MATERIALS: Paper or appropriate material, drawing provided in job sheet

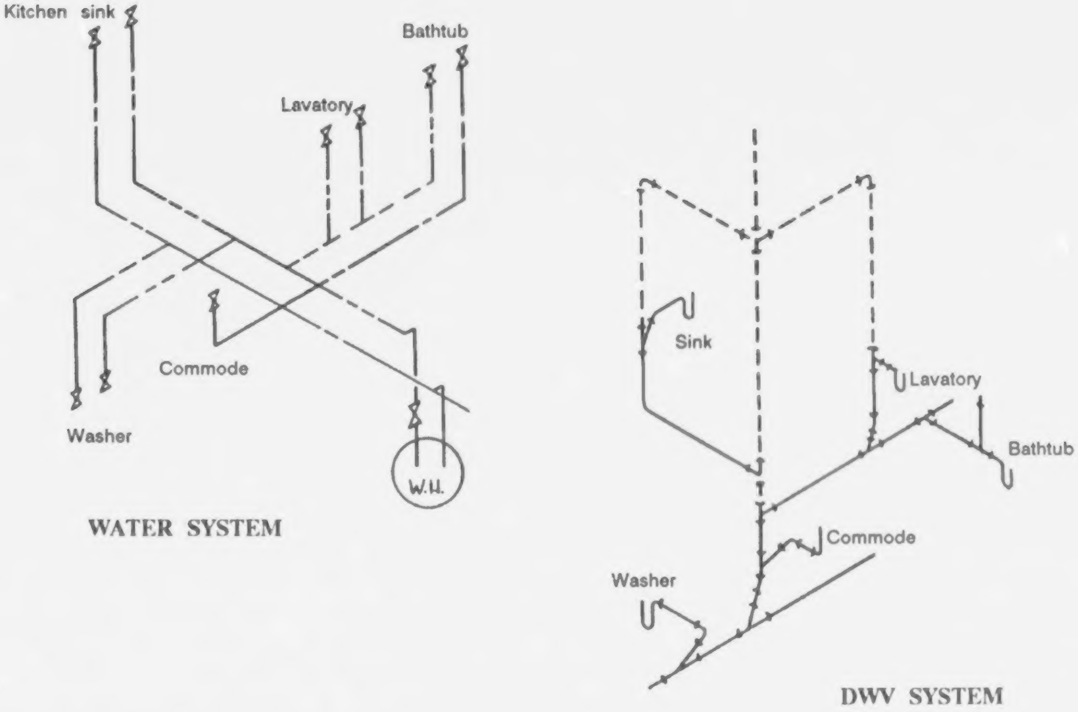
GENERAL INSTRUCTIONS: This activity can be used as a simulated work task in any building trades program. Student(s) can apply skills aquired in completing specified work task at a job site. Use proper safety precautions.

PROCEDURES AND/OR TASKS:

1. Assemble tools and materials needed.
2. Use scale 1/8" = 1'.
3. Develop an isometric sketch showing the piping system for the plan in Figure 1.

4. Connect the waste for tub and lavatory to a separate sanitary tee just below the W.C.
5. Note the scale being used.
6. Draw the drainage layout on the plan.
7. Draw an isometric view to scale.
8. Be sure to show inside or outside wall.
9. Draw the isometric view of all drainage piping.
10. Mark all piping to size according to code or the instructors' directions.
11. Have instructor check work.
12. Replace tools and materials.
13. Clean work area.

Figure 1


Kitchen sink
Bathtub
Lavatory
Commode
Washer
W.H.
Sink
Lavatory
Bathtub
Commode
Washer

WATER SYSTEM

DWV SYSTEM

STUDENT INFORMATION SHEET

PLUMBING

UNIT:	Fundamentals of Plumbing
TOPIC:	Drainage System Repair
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(5)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to interpret symbols and sketches correctly when repairing drainage and water systems.
SPECIFIC OBJECTIVE(S):	After completing this information sheet, the student(s) will be able to repair drainage systems correctly.
BASIC ACADEMIC SKILLS APPLICATION:	*Basic academic skills used with fundamentals of plumbing will include mathematical principles, oral and written communications, and application of reading concepts and skills.*

DRAINAGE SYSTEMS

If drains will not drain, or if they drain slowly, there is generally stoppage in the vent stack or the main drain has a stoppage.

A blocked vent can be cleaned easily by getting on the roof and running a plumber's tape or snake through the vent stack. When the stoppage is broken, water should start to flow out of the fixture. You should leave water running while removing the snake, as this will help clear the drain and prevent stoppage from reccurring. There are several types of snakes you can use: electronically-driven snake, hand-crank snake, flat-type snake, or a coil-type snake. (See TM-3.)

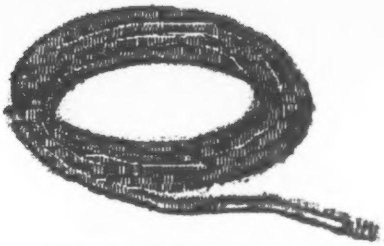
DWV PIPING SYSTEM

The DWV system operates on a gravity flow, so the proper slope is very important. A drop of 1/8 to 1/2 inch per foot is adequate for good flow. The drainage is designed first because it is expensive and is the most important part of a plumbing system.

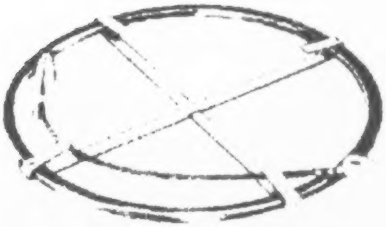
The piping system should be designed so that the lavatory, showers, and water closet are as close as possible and require as few turns as possible. Be sure of the size of pipe used. If pipe is oversized, the water action will reduce and the flow will be too shallow to carry away solids in the pipe. This will soon cause a stoppage in the line.

Materials used for the DWV system is ABS, PVC, copper, or cast iron. Materials will depend on the plumbing code requirements and cost and preference of the owner.

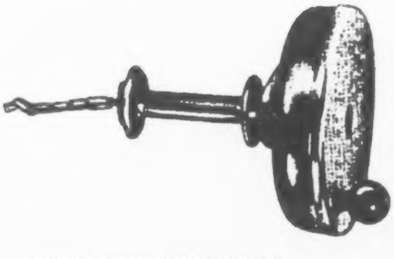
The ABS, acrylonitrile-butadiene-styrene, is mostly used for drain, waste, and vents. A schedule 40 is required for plumbing within a structure and can be identified by a stamp on the pipe.



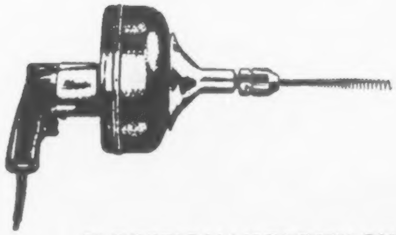
COIL-TYPE SNAKE



FLAT-TYPE SNAKE



HAND CRANK SNAKE



ELECTRICALLY DRIVEN SNAKE

TM-3

ASSIGNMENT SHEET

PLUMBING

NAME: ______________________ **DATE:** ______________

UNIT:	Fundamentals of Plumbing
TOPIC:	Drainage System Repair
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(5)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to interpret symbols and sketches correctly when repairing drainage and water systems.
SPECIFIC OBJECTIVE(S):	After completing this assignment sheet, the student(s) will be able to repair drainage systems correctly.
REFERENCE:	VI-2-B-IS B.T. I--Unit VII
DIRECTIONS:	Read and answer the following questions in the space provided.

1. What can cause water not to drain from fixtures?

2. What is used to clean stoppage in pipes?

3. How would you clean a vent pipe?

4. Why should you leave water running when removing a plumber's snake?

5. Name three types of snakes used in cleaning stoppage out of drainage systems.

JOB SHEET

PLUMBING

NAME ______________________________ **DATE** ____________________

UNIT: Fundamentals of Plumbing

NAME OF JOB: Clear Stoppage from a Water Closet Drain

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(5)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to interpret symbols and sketches when correctly repairing drainage and water systems.

SPECIFIC OBJECTIVE(S): Upon completion of this lesson, the student(s) will be able to repair a water closet drain correctly.

TOOLS AND EQUIPMENT: Water closet connected to the drain system, vacuum plunger, closet auger, bucket, clean cloth

MATERIALS: Roll of toilet tissue

GENERAL INSTRUCTIONS: This activity can be used as a simulated work task in any building trades program. Student(s) can apply skills aquired in completing specified work task at a job site. Facilities for task to be provided by instructor. Use proper safety precautions.

PROCEDURES AND/OR TASKS:

1. Assemble tools and materials needed.

2. Remove cover from tank.
3. Force the water through the water closet drain using a vacuum plunger.
4. Flush the water closet.
5. Be ready to stop the water flow if necessary.
6. If problem still exists, rod out drain with flexible cable and auger.
7. Remove the auger from drain, pulling the obstruction with the auger.
8. If the obstruction cannot be dislodged with the auger, disconnect the water closet and remove the obstruction from the drain.
9. Flush with a handful of toilet tissue to test flushing action.
10. Have instructor check work. The water closet must flush without overflowing when checked by the instructor.
11. Replace tools, equipment, and material.
12. Clean work area.

STUDENT INFORMATION SHEET

PLUMBING

UNIT: Fundamentals of Plumbing

TOPIC: Water System Repair

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(5)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to interpret symbols and sketches correctly when repairing drainage and water systems.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to repair water systems correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used with fundamentals of plumbing will include mathematical principles, oral and written communications, and application of reading concepts and skills.*

WATER SYSTEM REPAIR

There are many causes for leaks in pipes and couplings. Some of these are deterioration, punctures, impact, freezing, and shifting of soil pipes.

GALVANIZED PIPE

Galvanized pipe is most likely to leak from deterioration, usually at the threads where the coating has been removed. If threads are exposed at couplings, this lets the minerals in soils help to deteriorate the pipe and cause it to leak. If a weak spot develops in the wall of a pipe, it can be repaired by using a wrap-around clamp. The section can be cut out or the ends threaded by using a coupling, a union, and then reinstalled.

If water restriction is a problem, it is usually because of the minerals in the water building up inside the galvanized pipe. The only way to solve this is to remove the pipe and install new pipe.

PLASTIC PIPE

Plastic pipe has several advantages over galvanized pipe. The installation is much easier and cleaner, does not have to be threaded, and soil minerals do not affect the walls of the pipe.

When plastic pipe is installed in hot weather, it will bend or curve. This saves making cuts in the pipes and using elbows and couplings to change direction or go around an obstacle. By using plastic pipe, you have fewer connections, and it is not as likely to leak.

If a leak develops in a plastic fitting, the fitting, plus part of the pipe, must be replaced. Therefore, you would need to have new fittings, nipples, and couplings to repair the leak. Plastic pipe is installed by first using a cleaner where connections are to be made, applying the PVC glue on area cleaned, and installing fittings and pipes together.

COPPER FITTINGS

When copper fittings leak at joints, they can generally be repaired by resoldering the joint.

Turn off the water and drain completely before attempting to resolder the joint. Water at the joint will cool the copper joint, and solder will not melt and seal the joint. Clean the joint with an abrasive paper, and wipe clean; then apply flax to the cleaned area. Heat the pipe and apply the solder. After the solder has flowed into the joint, wipe the excess off.

If the joint leaks when water is turned on, turn off water and drain again. Heat the joint, and take it apart to be cleaned. Solder will not hold if dirt is inside the joint. After cleaning, seal the joint, reassemble, and solder again.

ASSIGNMENT SHEET

PLUMBING

NAME: ________________________________ **DATE:** ____________________

UNIT: Fundamentals of Plumbing

TOPIC: Water System Repair

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(5)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to interpret symbols and sketches correctly when repairing drainage and water systems.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will be able to repair water systems correctly.

REFERENCE:
VI-2-C-IS
B.T. I-Unit VII

DIRECTIONS: Read and answer each of the following questions in the space provided.

1. What are reasons for leaks in galvanized pipes?

2. Why are galvanized pipes more likely to leak at the threads?

3. How can a leak be repaired without replacing the pipe?

4. If water restriction is a problem, what is usually wrong, and what is the cause?

5. Why does plastic pipe last longer than galvanized pipe?

6. When will plastic pipe bend easily when being installed?

7. Why can fewer fittings be used when plastic pipe is installed?

8. Do obstacles have to be moved when using plastic pipe? Why?

9. If a plastic fitting has a leak, what would need to be replaced?

10. What is used to put fittings and pipe together?

JOB SHEET

PLUMBING

NAME ______________________________ DATE ____________________

UNIT: Fundamentals of Plumbing

NAME OF JOB: Replacing Cracked-Line Section PVC

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(5)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to interpret symbols and sketches correctly when repairing drainage and water systems.

SPECIFIC OBJECTIVE(S): After completing this lesson, the student(s) will be able to repair a cracked-line section PVC correctly.

TOOLS AND EQUIPMENT: Hacksaw, rag or shop towel, utility knife

MATERIALS: 3/4" section of 8' long PVC pipe, two 3/4" couplings, PVC cleaner, PVC glue

GENERAL INSTRUCTIONS: After finding where line is cracked with PVC pipe, it is usually simple to repair.

PROCEDURES AND/OR TASKS:

1. Collect materials needed to complete this task.
2. Locate area cracked in pipe.

3. Be sure water is turned off when leak is found.
4. Cut out section of pipe that is cracked at least two inches on each side of crack.
5. Measure opening after pipe is cut out.
6. Measure and cut new piece of pipe.
7. Use knife to remove burr on and off pipe being cut and on pipe being replaced.
8. Use PVC cleaner to clean all ends of pipe at least 2" back.
9. Use PVC cleaner inside both ends of couplings.
10. Use PVC glue to coat inside of coupling on one end.
11. Use PVC glue; coat one end of pipe where section was removed, and push coupling on pipe with glue on it.
12. Repeat steps 10 and 11 on other side of opening.
13. Coat inside of coupling; push new pipe into coupling, and twist 1/4"; let set 5 minutes.
14. Repeat step 13 on other end of pipe and let set.
15. Wait ten to fifteen minutes, then turn water on.
16. Have instructor check work.

STUDENT INFORMATION SHEET

PLUMBING

UNIT: Plumbing Installation

TOPIC: Installing Gas Water Heater

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(5)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install gas water heaters correctly.

SPECIFIC OBJECTIVE(S): After completing this information sheet, the student(s) will be able to install gas water heaters correctly.

BASIC ACADEMIC SKILLS APPLICATION: *Basic academic skills used with plumbing installation will include mathematical principles, application of reading concepts and skills, and oral and written communications.*

INSTALLING THE GAS WATER HEATER

When installing the gas water heater, you should be careful to have gas and water turned off before you start.

The following tools and equipment are needed for installing the gas hot-water heater (using galvanized pipe): gas water heater, relief valve, pipe fittings and valves, vent pipe, pipe vise, black iron pipe, reamer, pipe threader, oil can, pipe, gas pipe and fittings, and 3/4" valve.

PROCEDURE

Locate the relief-valve outlet on the water heater, and install the relief valve. Then, attach 3/4" approved line from the relief valve to the desired location of overflow. Next, install 3/4" valve on cold water supply line using the nipple, elbow, and union. Install 3/4" galvanized nipple, elbow, and union from heater to hot water supply line.

Using a three-inch galvanized vent pipe, run vent pipe through ceiling into attic, and be sure it is vented through the roof. Using required black iron pipe and fittings, connect gas line to water heater; turn gas supply on, and check for leaks using a soapy water solution. Open the water faucets, and turn on water supply to fill tank until water flows from faucets. Finally, light and adjust burner. These procedures should always be followed. The water heater can be very dangerous if not properly installed. Be sure that a relief valve is always installed because pressure can build up inside the tank, and it could possibly explode, causing fire and/or injury to persons nearby.

MAINTENANCE ON WATER HEATERS

The spout on the water heater tank should be opened every six months to drain sediments. Check the pressure and temperature, and lift the valve to allow a small amount of water to escape.

In addition, clean pilot and burner annually, and adjust the flame, which should be clean and blue.

There are basically two types of hot water heaters, natural gas and electric.

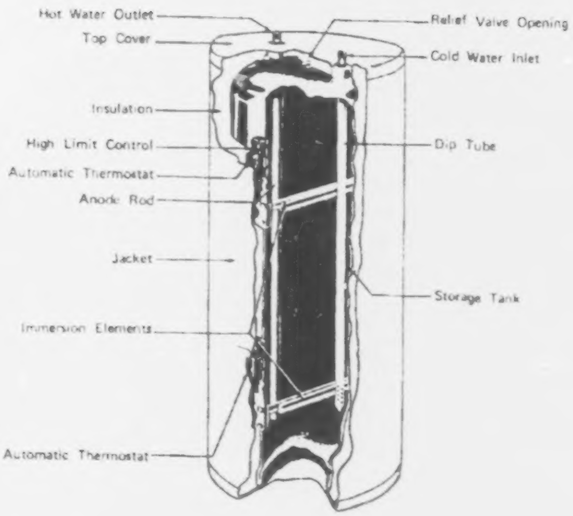
An electric water heater is often preferred because it does not have to be vented. (See TM-4).

INSUFFICIENT HOT WATER

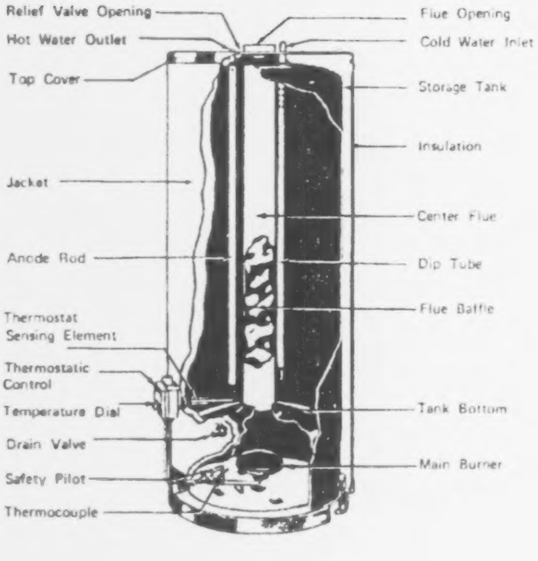
Insufficient hot water is usually caused by water heaters being too small. When a large amount of hot water is needed, the best solution is to install a larger water heater.

If the water is always warm, check the thermostat setting. It could have been changed. Reset the thermostat, and then check the temperature of the water being used.

It is also possible for the dip tube to be too close to the top of the tank, or the tank may have a hole near the top, letting the cold water mix with the hot. This will cause the water to always be warm and not get hot.


Hot Water Outlet
Top Cover
Insulation
High Limit Control
Automatic Thermostat
Anode Rod
Jacket
Immersion Elements
Automatic Thermostat
Relief Valve Opening
Cold Water Inlet
Dip Tube
Storage Tank

ELECTRIC WATER HEATER


Relief Valve Opening
Hot Water Outlet
Top Cover
Jacket
Anode Rod
Thermostat Sensing Element
Thermostatic Control
Temperature Dial
Drain Valve
Safety Pilot
Thermocouple
Flue Opening
Cold Water Inlet
Storage Tank
Insulation
Center Flue
Dip Tube
Flue Baffle
Tank Bottom
Main Burner

GAS WATER HEATER

ASSIGNMENT SHEET

PLUMBING

NAME: ______________________________ **DATE:** __________________

UNIT: Plumbing Installation

TOPIC: Installing Gas Water Heater

ESSENTIAL ELEMENT(S):
(a)(7)(A)
(a)(7)(C)
(a)(7)(D)
(a)(7)(E)
(e)(5)

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install gas water heaters correctly.

SPECIFIC OBJECTIVE(S): After completing this assignment sheet, the student(s) will be able to install gas water heaters correctly.

REFERENCE: VI-3-A-IS

DIRECTIONS: Read and answer each of the following questions in the space provided.

1. What is used to let pressure escape from the water heater tank, and how is it installed?

2. How and why is the gas hot water heater vented out?

3. What procedure is used to check for gas leaks?

4. How often should sediment be removed?

5. What would be an advantage of an electric water heater?

6. Where would a water valve be placed when installing a water heater?

7. What should be used to vent a water heater?

8. Why is it necessary to install a relief valve?

9. What is the last operation you would do when installing the water heater?

10. Why is an electric water heater preferred over a gas water heater?

11. What is the difference in diameter between 1/2 inch copper tubing and 5/8 inch copper tubing?

    ______ inch.

JOB SHEET

PLUMBING

NAME ______________________________ DATE ________________

UNIT:	Plumbing Installation
NAME OF JOB:	Checking for Gas Leaks
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(5)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install gas water heaters correctly.
SPECIFIC OBJECTIVE(S):	Upon completion of this lesson, the student(s) will be able to check for gas leaks correctly and safely.
TOOLS AND EQUIPMENT:	Plastic bottle, adjustable wrench, can or plastic container
MATERIALS:	Soap, water
GENERAL INSTRUCTIONS:	Mix soap and water together, and pour it into the plastic bottle. Then, with a spout attached to the end of the bottle, apply the mixture to the pipe and fittings to check for leaks.

PROCEDURES AND/OR TASKS:

1. Remove top from plastic bottle.
2. Mix soap and water together in can.
3. Pour the soap and water into the plastic bottle.

4. Attach the cap, with spout, onto bottle, and close end until ready to use.

5. When gas is turned on, open cap end and apply soapy water around joints and fittings to check for leaks.

6. If no leaks are found, water heater can be started by lighting pilot and turning burner on.

JOB SHEET

PLUMBING

NAME ____________________________ DATE ________________

UNIT:	Plumbing Installation
NAME OF JOB:	Install An Electric Water Heater
ESSENTIAL ELEMENT(S):	(a)(7)(A) (a)(7)(C) (a)(7)(D) (a)(7)(E) (e)(5)
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to install water heaters correctly.
SPECIFIC OBJECTIVE(S):	Upon completion of this lesson, the student(s) will be able to install an electric water heater correctly.
TOOLS AND EQUIPMENT:	Tube cutter with a reamer, air-acetylene torch, striker, tank wrench, adjustable wrench
MATERIALS:	Solder, flux, sand cloth, tubing, pipe compound, fittings as needed, relief valve, water heater, two 3/4" male adapters, one 3/4" gate valve
GENERAL INSTRUCTIONS:	This activity can be used as a simulated work task in any building trades program. Student(s) can apply skills aquired in completing specified work task at a job site. Facilities for task to be provided by instructor. Use proper safety precautions.

PROCEDURES AND/OR TASKS:

1. Assemble tools, equipment, and material needed.
2. Remove water heater from the carton.

3. Assemble soldering tools, solder, and two 3/4" male adapters onto two 8" pieces of 3/4" copper tubing.
4. Allow fittings to cool thoroughly before installing in the tank.
5. Apply pipe compound to the threads of the relief valve and install the valve in the heater tank where marked.
6. Install all the tubing from the relief valve to within 12" of the floor.
7. Position the heater in the proper place for installation.
8. Be sure the electric elements are accessible.
9. Apply the pipe compound/tape to 3/4" adapters and install them in inlet and outlet openings using the adjustable wrench.
10. Clean and flux 3/4" valve and tubing ends protruding from 3/4" male adapters.
11. Install 3/4" valve on cold water inlet tubing.
12. Clean and flux tubing for cold and hot water connections.
13. Install tubing to make soldered connections.
14. Before soldering, open the valve.
15. Close the drain valve.
16. Open the hot water faucet on the nearest fixture.
17. Open the cold water inlet valve on the water heater.
18. When water runs freely from fixture faucet, close the inlet valve.
19. Have electrician connect the water heater and the task will be complete.
20. Have instructor check work.
21. Replace tools, equipment, and materials.
22. Clean work area.

APPENDIX VI-A

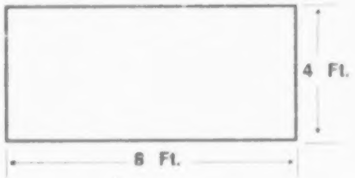
PLUMBING FORMULAS

Computing Area and Volume:

Area of rectangular surface

Area = length x width
$A = 8 \text{ ft.} \times 4 \text{ ft.}$
$A = 32 \text{ sq. ft.}$

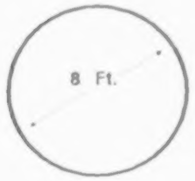
Example:



Area of a Circle

$\text{Area} = \pi r^2$
$\pi = 3.14 \qquad r = \text{radius} = 1/2 \text{ diameter}$
$A = 3.14 \times (4)^2$
$A = 3.14 \times 16 \text{ sq. ft.}$
$A = 50.24 \text{ sq. ft.}$

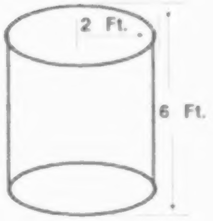
Example: diameter = 8 ft.; radius = 4 ft.



Volume of a cylindrical tank

$\text{Volume} = \pi r^2 h$
Volume = pi x radius (squared) x height
$V = \pi r^2 h$
$V = 3.14 \times (2 \text{ ft.})^2 \times 6 \text{ ft.}$
$V = 75.36 \text{ cu.ft.}$

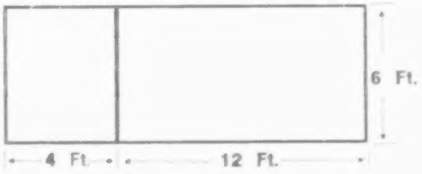
Example:



Volume of rectangular tank

Volume = length (L) x width (W) x height (H)
$V = LWH$
$V = 12 \text{ ft.} \times 4 \text{ ft.} \times 6 \text{ ft.}$
$V = 288 \text{ cu. ft.}$

Example:



Conversion for Cubic Measures to Gallons

To Convert	To	Procedure	Example
cubic inches	gallons	divide by 231	376 cu. in. ÷ 231 = 163 gal.
cubic feet	gallons	multiply by 7.48	6 cu. ft. x 7.48 = 44.88 gal.

APPENDIX VI-B

GLOSSARY

ABS (Acrylonitrile-Butadiene-Styrene)--Plastic to make drainage and pipe fittings.

Adapter--Fittings used to join different sizes and different materials together.

Aerator--Adds air to water.

AGA--American Gas Association.

Air lock--Trapped air in a pipe that restricts the flow of liquid through the pipe.

Anaerobic bacteria--Lives and works in the absence of free oxygen (air).

Area of a circle--Formula is $\pi R^2 = 3.14 \times$ radius (squared).

ASHRAE--American Society of Heating, Refrigeration, and Air Conditioning Engineering.

ASTM--American Society for Testing Materials.

AWWA--American Water Works Association.

Backfill--Sand, earth, and gravel used to fill excavated trench.

Basin wrench--Has a swiveling jaw used to install or remove nuts in hard-to-reach places.

Bell or hub--Enlarged end of some types of pipe that fit over the next section of pipe.

Bond--To change direction in piping.

Bib--Another name for faucet.

Blowoff--Controlled discharge of excess pressure.

Blueprint--The copying of drawings that will produce white-line copy on blue background.

Bracket hanger--Used to support wall-hung sinks.

Building lines--Outside of the building foundation.

Bushing--Used to connect pipes of different sizes.

Cap--Used to close off end of a piece of pipe.

Caulk--Used to seal joints in cast iron drainage pipe.

Cement--Bonds other materials together.

Chalkline--Marking tool consisting of a string coated with chalk.

CI--Abbreviation for cast iron.

CISP--Abbreviation for cast iron soil pipe.

CISPI--Cast Iron Soil Pipe Institute.

Clarified sewage--Part or all of the suspended matter has been removed.

Close nipple--Shortest length of pipe threaded on both ends.

Cold chisel--A hand tool used with a hammer to cut metal.

Common vent--Vent serving two or more drainage stacks.

Continuous waste--Two or more fixtures connected to the same trap.

Corporation stop--Valve installed on water main for service to a building.

Coupling--A fitting with female threads on both ends.

CPVC--Chlorinated polyvinyl chloride, a plastic used in making pipes to carry hot water and chemicals.

Cross--Pipe fitting with four female openings at right angles to one another.

Cross connection--Any link between contaminated water and potable water in a water supply.

Curb box--Casting made to go in the ground over the corporation stop.

Crawl space--Space between floor frame and ground.

Crude sewage--Untreated sewage.

Cu. ft.--Cubic foot or feet

Cu. in.--Cubic inch

CW--Cold water

Deg--Degree of a circle

DF--Drinking fountain

Die--Tool to cut external threads by hand or machine.

Double hub--Cast iron pipe having a bell on both ends.

Drain--Pipe in the drainage system that carries waste water.

Drift plug--Plug that is driven through a soft metal pipe to remove dents.

Dry vent--Vent that does not carry waste water.

DWG--Abbreviation for drawing.

DWV--Abbreviation for drainage, waste, and vent systems.

Eccentric fitting--A fitting where the centerline of the opening is offset.

Effluent--Outflow from sewage treatment equipment.

Elbow--Fitting with two openings; causes a run of pipe to change directions.

EWC--Electric water cooler

Fall--The amount of slope given to horizontal runs of pipe.

Female thread--Any internal thread.

F. G.--Finish grade

Fill--Loose earth used to raise the ground level around a structure.

Fittings--Parts of a piping system which are used to join sections of pipe.

Frostline--Depth of frost penetration in soil.

FPT--Female pipe thread

FS--Federal specification

FTG--Fitting

FU--Fixture unit

Furnace--Central heating device exclusive of any ductwork or piping.

GALV--Galvanized

Girder--Beam of steel or wood that supports framing members in the structure.

GPD--Gallons per day

GPM--Gallons per minute

Grade--Slope of a horizontal run of pipe.

Ground water--Water in subsoil.

Hacksaw--Metal cutting saw with a replaceable blade.

Hanger--Support for pipe.

HB--Hose bib

HD--Head

Humidifier--Device for adding moisture to the air in closed spaces.

HW--Hot water

Hydronics--Practice of heating and/or cooling with water.

ID--Inside diameter

IPS--Iron pipe size

Keel--Marking crayon used to mark pipe.

K grade copper pipe--Pipe suitable for installation underground.

KW--Kilowatt

LAV--Lavatory

Lay out--Act of measuring and marking location of something.

Lb--Pound

Level--Tool used to determine if something is horizontal or vertical.

Lot line--Forms the legal boundary of a piece of property.

Main Water Line--Large water supply pipe to which branches are connected.

Male threads--Threads on outside of pipe, fittings, or valves.

Mallet--A soft-face hammer.

Man hole--Opening in the sanitary or storm sewer system to permit access.

Manifold--Pipe that has many outlets close together.

Master plumber--Plumber licensed to install plumbing and assume responsibility for contractual agreements.

Nipples--Lengths of pipe less than 12 inches, with male threads on both ends.

Nonbearing wall--Wall in a structure that supports no load but its own.

NPS--Nominal pipe size

O-Ring--Rubber seal used around stems of some valves to prevent water leakage.

Penny--Nail measurement

Pipe die--Tool for cutting external pipe threads.

Plumb--Exactly perpendicular.

Pheumatics--Study of compressible gases: their properties and reactions in containment.

Potable water--Water satisfactory for drinking and domestic use.

PPM--Parts per million

Pressure head--Force or pressure created by a depth of one foot of water.

PSI--Pounds per million

Quarter bend--Pipe fitting which makes a 90° angle.

Reaming--To remove a burr from inside of a pipe that has been cut with a pipe cutter.

Reamer--Tool used in reaming.

Relief valve--Pressure safety valve placed on water heaters.

Roof drain--Drain installed in a flat or nearly flat roof to receive water and run to down spout.

Sanitary sewer--Piping system that carries waste away.

Sanitary T branch--A fitting in the shape of a T.

Sanitary Y branch--Fitting for drain shaped like a Y.

Scaffold--Platform erected temporarily to support workers and materials.

Service pipe--Pipe from water supply to building served.

Siphonage--Partial vacuum created by the flow of liquid in pipe.

Soil pipe--Pipe which carries sanitary sewage.

Spigot--Plain end of a cast iron pipe.

Stem--Shaft of a faucet which holds the washer and to which the handle is attached.

Stopcock--A small ground key valve.

Tamp--To firmly compact earth during backfilling.

Tapered reamer--Tool to deburr and clean inside of pipes.

Trap--Drainage fitting to produce a water seal to prevent sewer gas from entering the building.

Union--Fitting used to join two pieces of pipe without cutting.

Vacuum--Air pressure below atmospheric pressure.

Valve--Device that controls the flow of a liquid within a pipe.

Vent relief--Vent installed at the point where waste piping changes direction.

Vent wet--Pipe that serves both a vent and a drain.

Vibrator--Tool used to remove air pockets from concrete as walls are poured.

VTR--Vent through roof

Waste--Liquid discharged from a fixture.

Water hammer--Banging sound in water supply pipes caused by sudden stopping of waterflow.

WH--Wall hydrant

Working drawing--Shows exactly how a building should be constructed.

XH--Extra heavy

Y or WYE branch--Section of pipe that joins the main run of pipe at an angle.

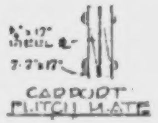
Zoning--Building restrictions which regulate the size, location, and type of structures to be built.

APPENDIX VI-C

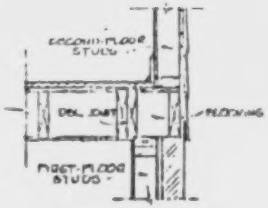
MATERIALS & FINISH SCHEDULE

NO	ROOM	FLOOR		BASE		WALLS		CEILING	
		MATERIAL	FINISH	MATERIAL	FINISH	MATERIAL	FINISH	MATERIAL	FINISH
1	DINING	OAK	VARNISH	WOOD	FLAT PAINT	GYPSUM BD	FLAT PAINT	GYPSUM BD	FLAT PAINT
2	FOYER								
3	DEN								
4	HALL	↓	↓						
5	KITCHEN	V. TILE	WAX	↓	↓				
6	UTILITY	C. TILE	NONE	C. TILE	NONE				
7	TOILET	↓	↓	↓	↓	*			
8	LIVING	OAK	VARNISH	WOOD	FLAT PAINT	↓	↓	↓	↓

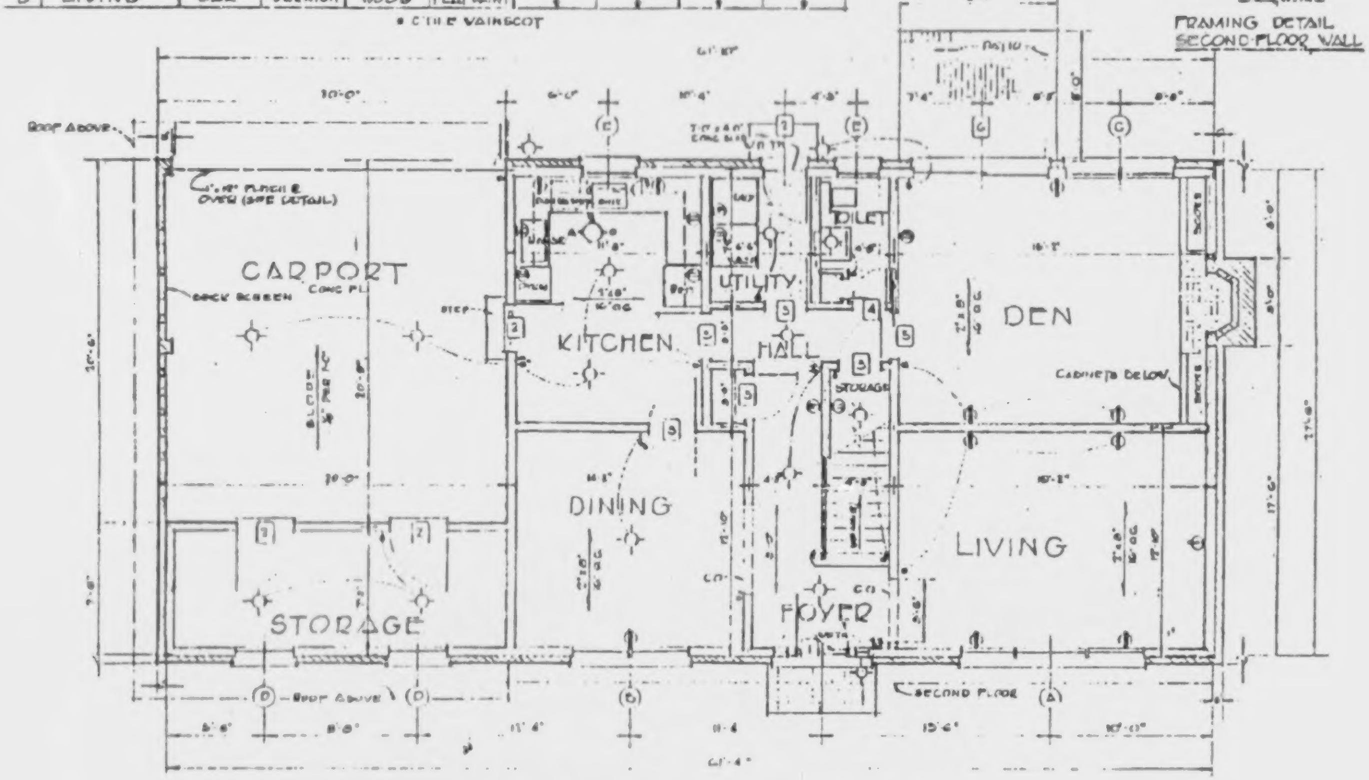
* C TILE VAINSCOT


$\frac{3}{8}$" x 12"
STEEL PL.
2-2" x 12"

CARPORT FLITCH PLATE


SECOND-FLOOR STUDS
DBL. JOIST
FLOORING
FIRST-FLOOR STUDS

FRAMING DETAIL
SECOND-FLOOR WALL


CARPORT
CONC FL.
BRICK SCREEN
ROOF ABOVE
2-2" x 12" FLITCH PLATE OVER (SEE DETAIL)
STEP
STORAGE
KITCHEN
UTILITY
HALL
BATH
TOILET
STORAGE
DEN
PATIO
CABINETS BELOW
BOOKS
DINING
FOYER
LIVING
SECOND FLOOR
ROOF ABOVE
10'-0"
6'-0"
10'-4"
4'-3"
7'-4"
6'-6"
8'-0"
8'-4"
16'-2"
16'-2"
17'-6"
20'-6"
10'-0"
5'-6"
8'-0"
11'-4"
11'-4
15'-6"
10'-0"
61'-4"
(A)
(B)
(C)
(D)
(E)
(G)
1
2
3
4
5

FIRST-FLOOR PLAN

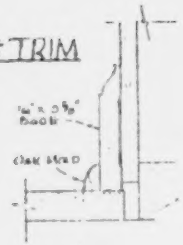
BEST COPY AVAILABLE

MATERIALS & FINISH SCHEDULE

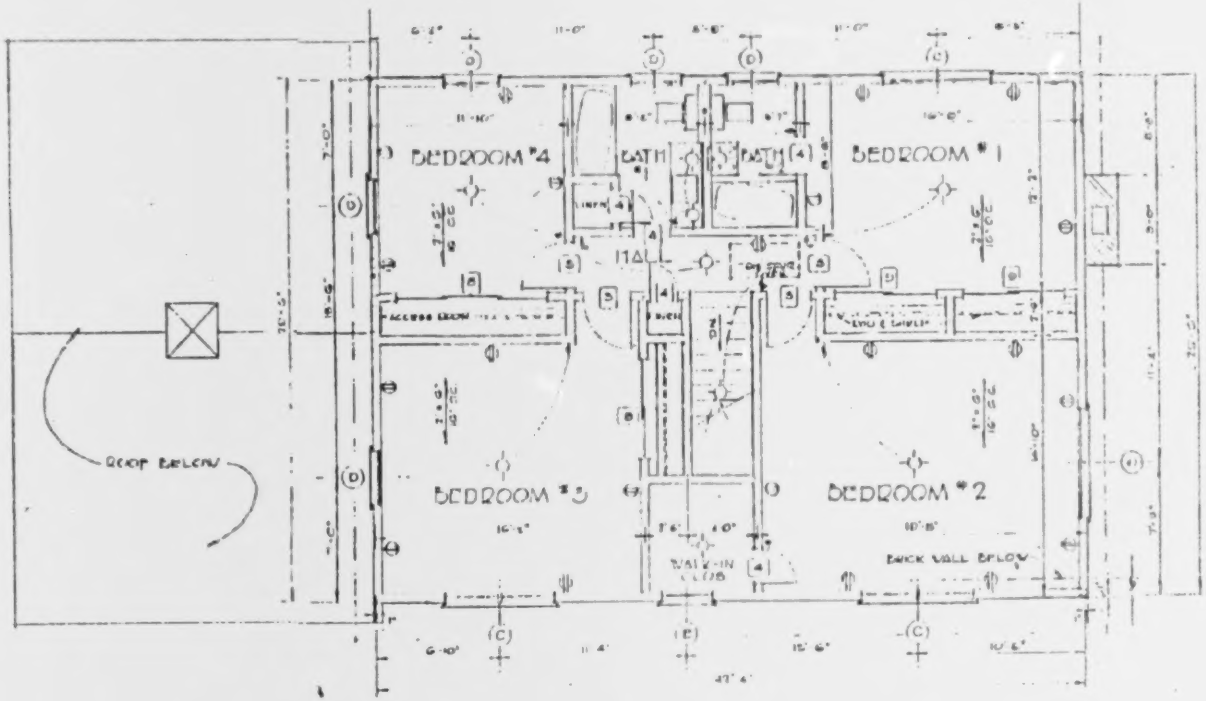
NO	ROOM	FLOOR		BASE		WALLS		CEILING	
		MATERIAL	FINISH	MATERIAL	FINISH	MATERIAL	FINISH	MATERIAL	FINISH
1	BEDROOM #1	OAK	VARNISH	WOOD	FLAT PAINT	GYPSUM BD	FLAT PAINT	GYPSUM BD	FLAT PAINT
2	BEDROOM #2								
3	BEDROOM #3								
4	BEDROOM #4								
5	CLOSETS								
6	HALL								
7	BATH #1	CER TILE	NONE	CER TILE	NONE	*			
8	BATH #2					*			

* CER TILE WAINSCOT

BASE TRIM



1/2" x 3 5/8" BASE
OAK MOLD



BEDROOM #4
BATH #1
BATH
BEDROOM #1
HALL
BEDROOM #3
BEDROOM #2
WALK-IN CLOS
ROOF BELOW
BRICK WALL BELOW
(D)
(C)
(E)
47' 4"

SECOND-FLOOR PLAN

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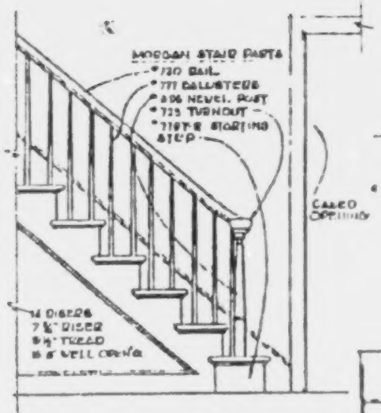
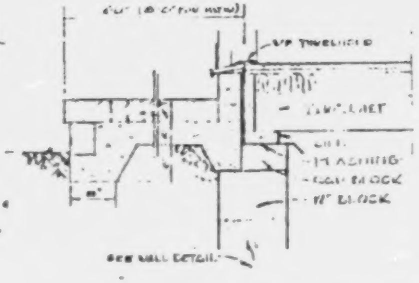
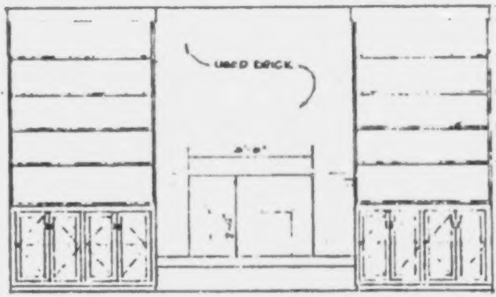

MORGAN STAIR PARTS
*730 RAIL
*777 BALUSTERS
*896 NEWEL POST
*725 TURNOUT
*7107-R STARTING STEP
14 RISERS
7 ½" RISER
9 ½" TREAD
10' 5" WELL OPEN'G
CASED OPENING

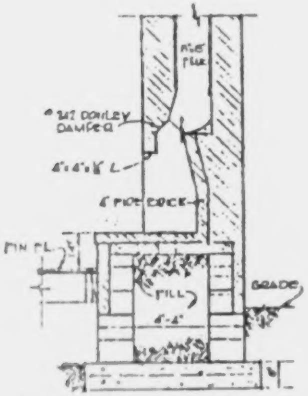
STAIR DETAIL


TREAD
SILL
FLASHING
CAP BLOCK
8" BLOCK
SEE WALL DETAIL

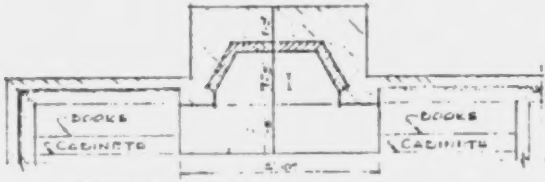
FRONT STEP DETAIL



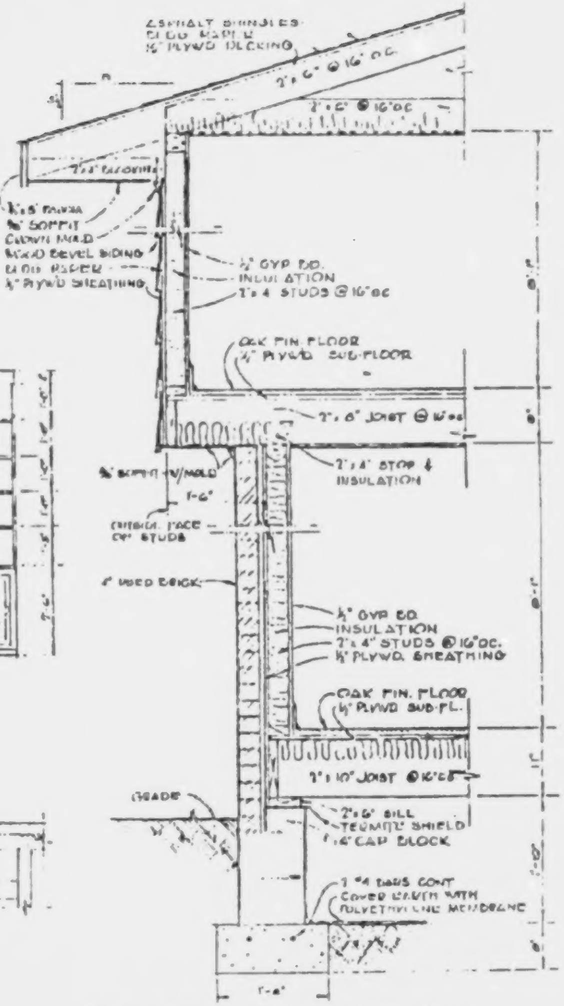
FIREPLACE ELEVATION


FLUE
#212 DONLEY DAMPER
4"x4"x⅜" L
FIRE BRICK
FIN. FL.
FILL
GRADE

FIREPLACE SECTION


BOOKS
CABINETS
BOOKS
CABINETS

FIREPLACE PLAN


ASPHALT SHINGLES
BLDG PAPER
½" PLYWD DECKING
2" x 6" @ 16" OC
2" x 6" @ 16" OC
2" x 8" FASCIA
1"x8" FASCIA
⅜" SOFFIT
CROWN MOLD
WOOD BEVEL SIDING
BLDG PAPER
½" PLYWD SHEATHING
½" GYP BD.
INSULATION
2" x 4" STUDS @ 16" OC
OAK FIN. FLOOR
½" PLYWD SUB-FLOOR
2" x 8" JOIST @ 16" oc
⅜" SOFFIT W/MOLD
1'-6"
2" x 4" STOP & INSULATION
FINISH FACE OF STUDS
4" USED BRICK
½" GYP BD.
INSULATION
2" x 4" STUDS @ 16" OC.
½" PLYWD. SHEATHING
OAK FIN. FLOOR
½" PLYWD SUB-FL.
2" x 10" JOIST @ 16" oc
GRADE
2" x 6" SILL
TERMITE SHIELD
4" CAP BLOCK
2 #4 BARS CONT
COVER EARTH WITH POLYETHYLENE MEMBRANE
1'-8"

FRONT WALL DETAIL

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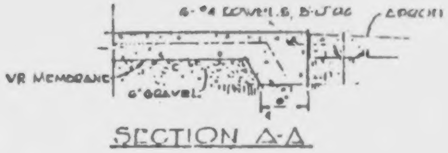
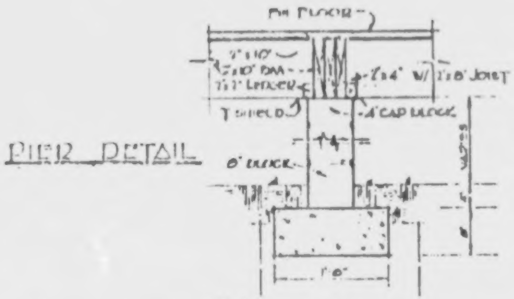
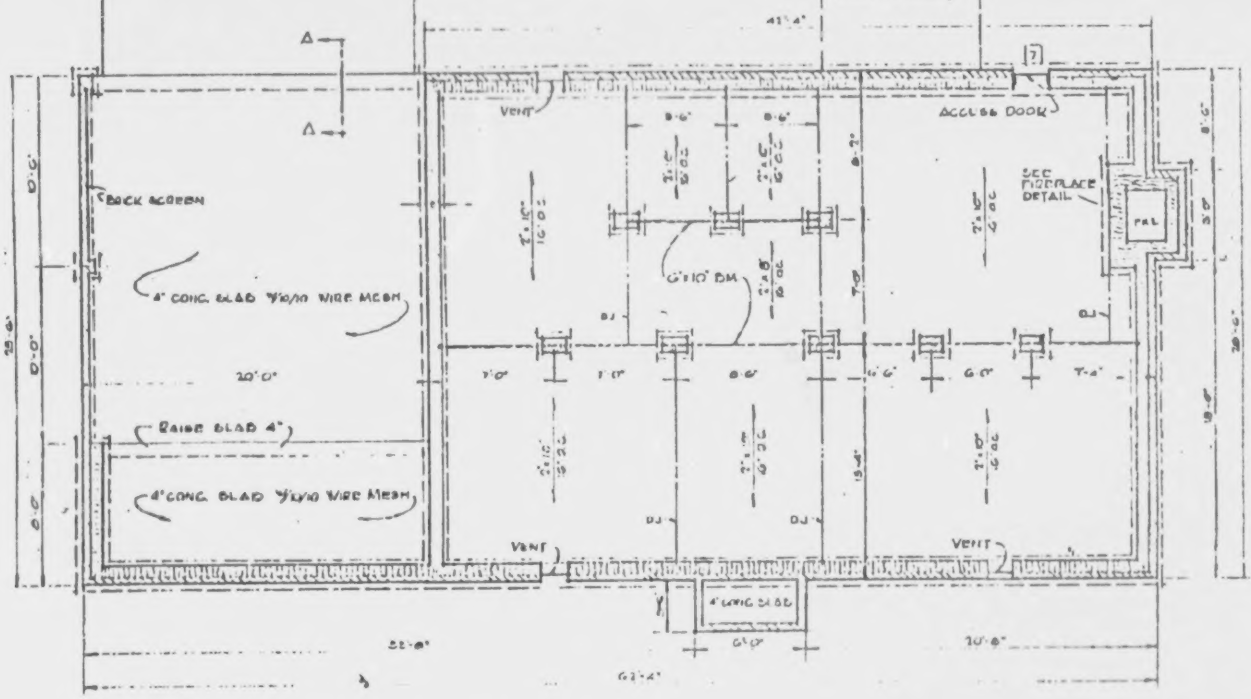

6-#4 DOWELS, 2'-0" OC
PORCH
VR MEMBRANE
6" GRAVEL
8"

SECTION A-A


FIN FLOOR
2"x10"
2"x10" BM
2"x2" LEDGER
2"x4" W/ 2"x8" JOIST
T SHIELD
4" CAP BLOCK
8" BLOCK
1'-8"

PIER DETAIL


A
A
41'-4"
VENT
ACCESS DOOR
8'-6"
8'-6"
8'-2"
BRICK SCREEN
SEE FIREPLACE DETAIL
FPL
2"x10" 16" OC
2"x8" 16" OC
2"x10" 16" OC
6"x10" BM
4" CONC. SLAB 6x6/10x10 WIRE MESH
20'-0"
DJ
DJ
7'-0"
7'-0"
8'-6"
4'-6"
6'-0"
7'-4"
RAISE SLAB 4"
4" CONC. SLAB 6x6/10x10 WIRE MESH
DJ
DJ
VENT
VENT
4" CONC. SLAB
22'-8"
6'-0"
20'-8"
63'-4"
8'-6"
5'-0"
28'-0"
18'-6"
10'-0"
25'-6"
8'-0"

FOUNDATION PLAN

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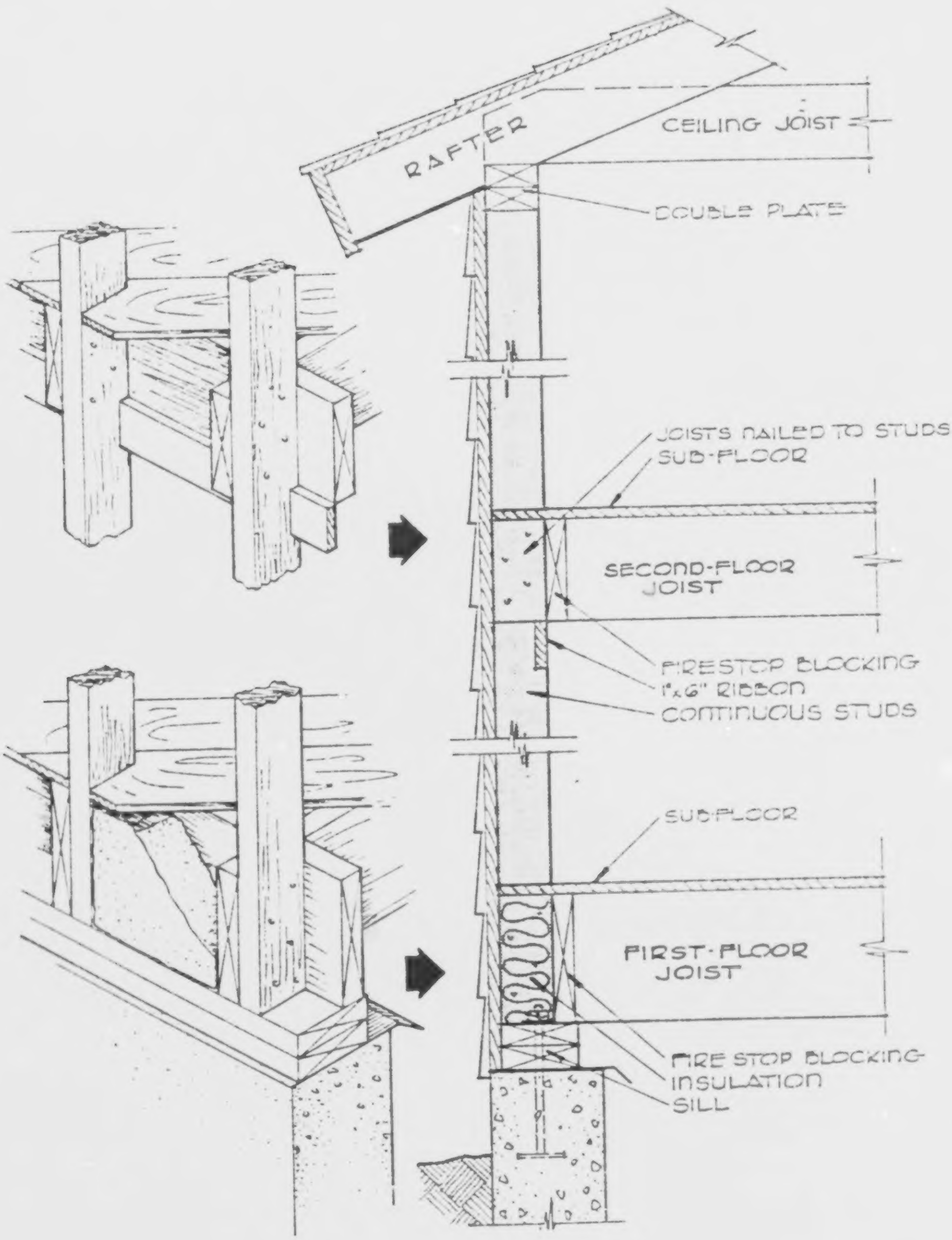
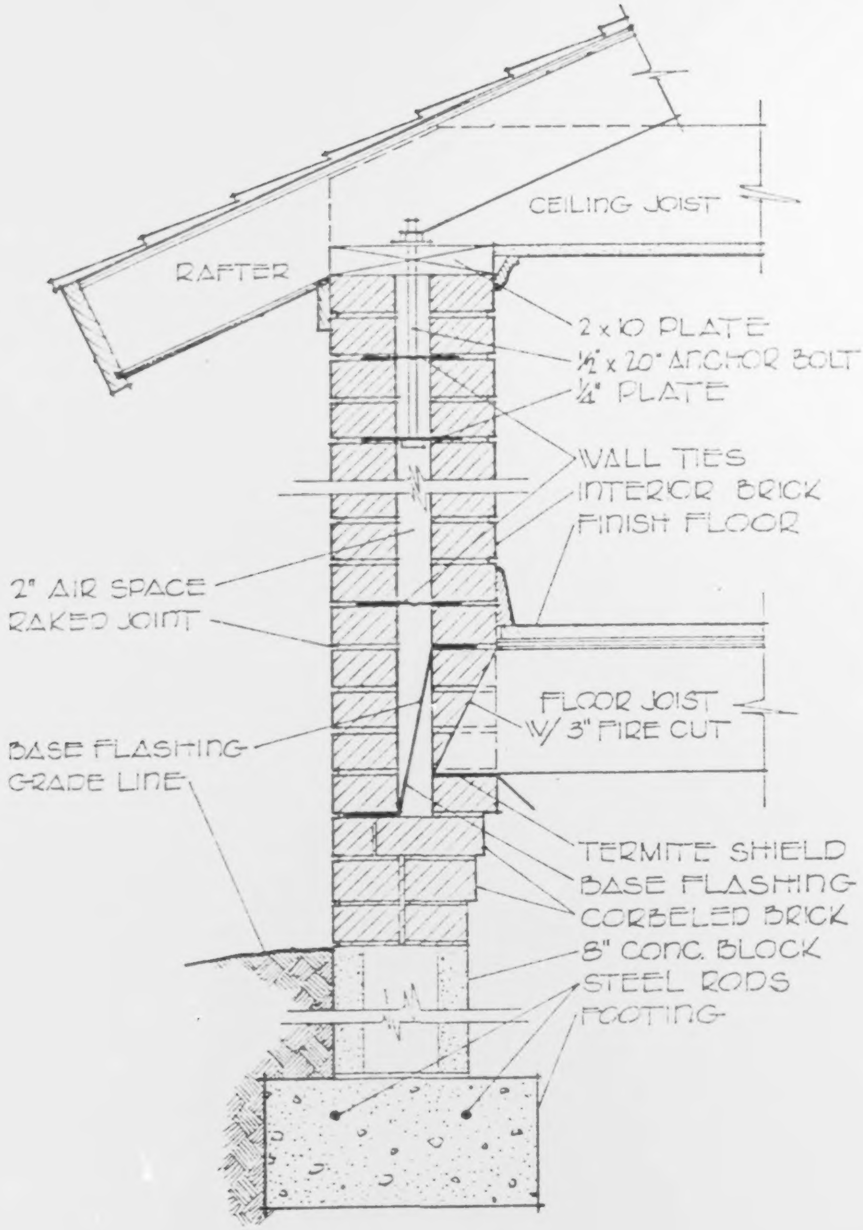
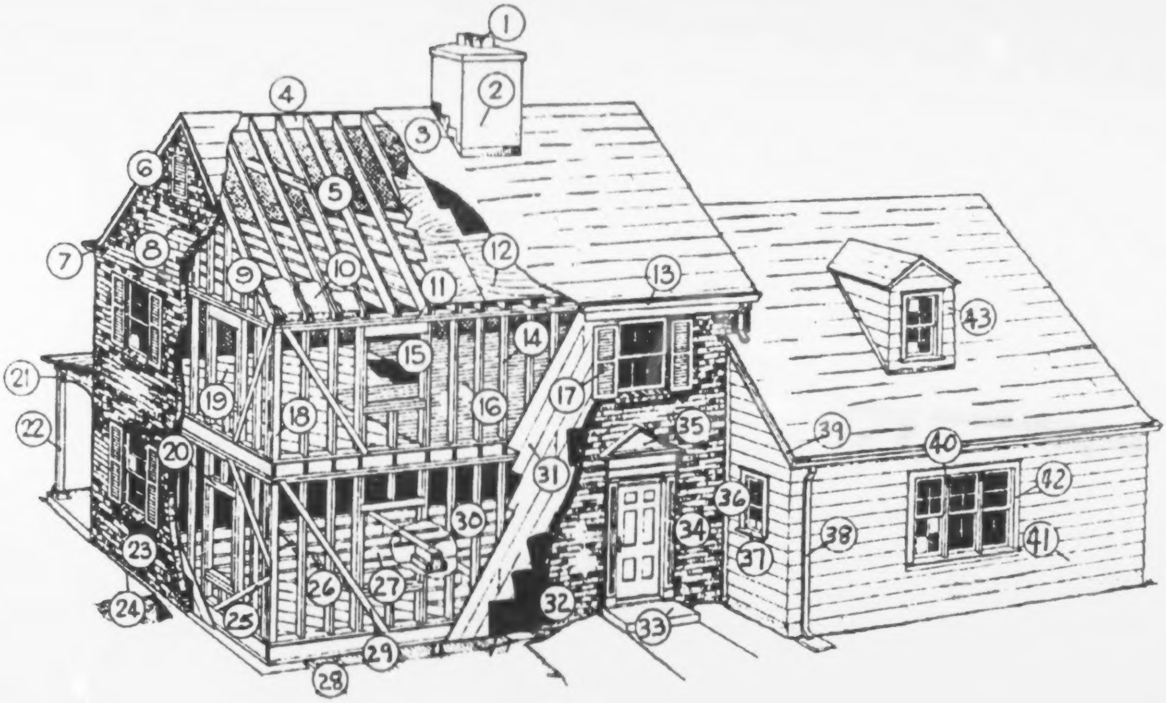

RAFTER
CEILING JOIST
DOUBLE PLATE
JOISTS NAILED TO STUDS
SUB-FLOOR
SECOND-FLOOR JOIST
FIRESTOP BLOCKING
1"x6" RIBBON
CONTINUOUS STUDS
SUB-FLOOR
FIRST-FLOOR JOIST
FIRE STOP BLOCKING
INSULATION
SILL


CEILING JOIST
RAFTER
2 x 10 PLATE
½" x 20" ANCHOR BOLT
¼" PLATE
WALL TIES
INTERIOR BRICK
FINISH FLOOR
2" AIR SPACE
RAKED JOINT
FLOOR JOIST
W/ 3" FIRE CUT
BASE FLASHING
GRADE LINE
TERMITE SHIELD
BASE FLASHING
CORBELED BRICK
8" CONC. BLOCK
STEEL RODS
FOOTING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1. Chimney flues or pots
2. Chimney
3. Flashing
4. Ridgeboard
5. Collar beam
6. Vent; louver
7. Cornice return
8. Brick veneer
9. End rafter
10. Installation
11. Top double plate
12. Roof decking
13. Gutter
14. Stud
15. Flooring paper
16. Finish flooring
17. Shutter
18. Corner post
19. Subfloor
20 Lintel; header
21. Porch frieze board
22. Porch post
23. Brick sill
24. Grade line
25 Knee brace
26 Bridging
27. Floor joists
28. Sill plate
29. Corner brace
30. Beam; girder
31. Wall sheathing
32. Building paper
33. Stoop
34. Trim pilaster
35. Pediment door trim
36. Double-hung window
37. Windowsill
38. Downspout; leader
39. Rake mold
40. Mullion
41. Bevel siding
42. Wood window trim
43. Dormer

COMPLIANCE STATEMENT

TITLE VI, CIVIL RIGHTS ACT OF 1964; THE MODIFIED COURT ORDER, CIVIL ACTION 5281, FEDERAL DISTRICT COURT, EASTERN DISTRICT OF TEXAS, TYLER DIVISION

Reviews of local education agencies pertaining to compliance with Title VI Civil Rights Act of 1964 and with specific requirements of the Modified Court Order, Civil Action No. 5281, Federal District Court, Eastern District of Texas, Tyler Division are conducted periodically by staff representatives of the Texas Education Agency. These reviews cover at least the following policies and practices:

(1) acceptance policies on student transfers from other school districts;

(2) operation of school bus routes or runs on a non-segregated basis;

(3) nondiscrimination in extracurricular activities and the use of school facilities;

(4) nondiscriminatory practices in the hiring, assigning, promoting, paying, demoting, reassigning, or dismissing of faculty and staff members who work with children;

(5) enrollment and assignment of students without discrimination on the basis of race, color, or national origin;

(6) nondiscriminatory practices relating to the use of a student's first language; and

(7) evidence of published procedures for hearing complaints and grievances.

In addition to conducting reviews, the Texas Education Agency staff representatives check complaints of discrimination made by a citizen or citizens residing in a school district where it is alleged discriminatory practices have occurred or are occurring.

Where a violation of Title VI of the Civil Rights act is found, the findings are reported to the Officer for Civil Rights, Department of Health, Education, and Welfare.

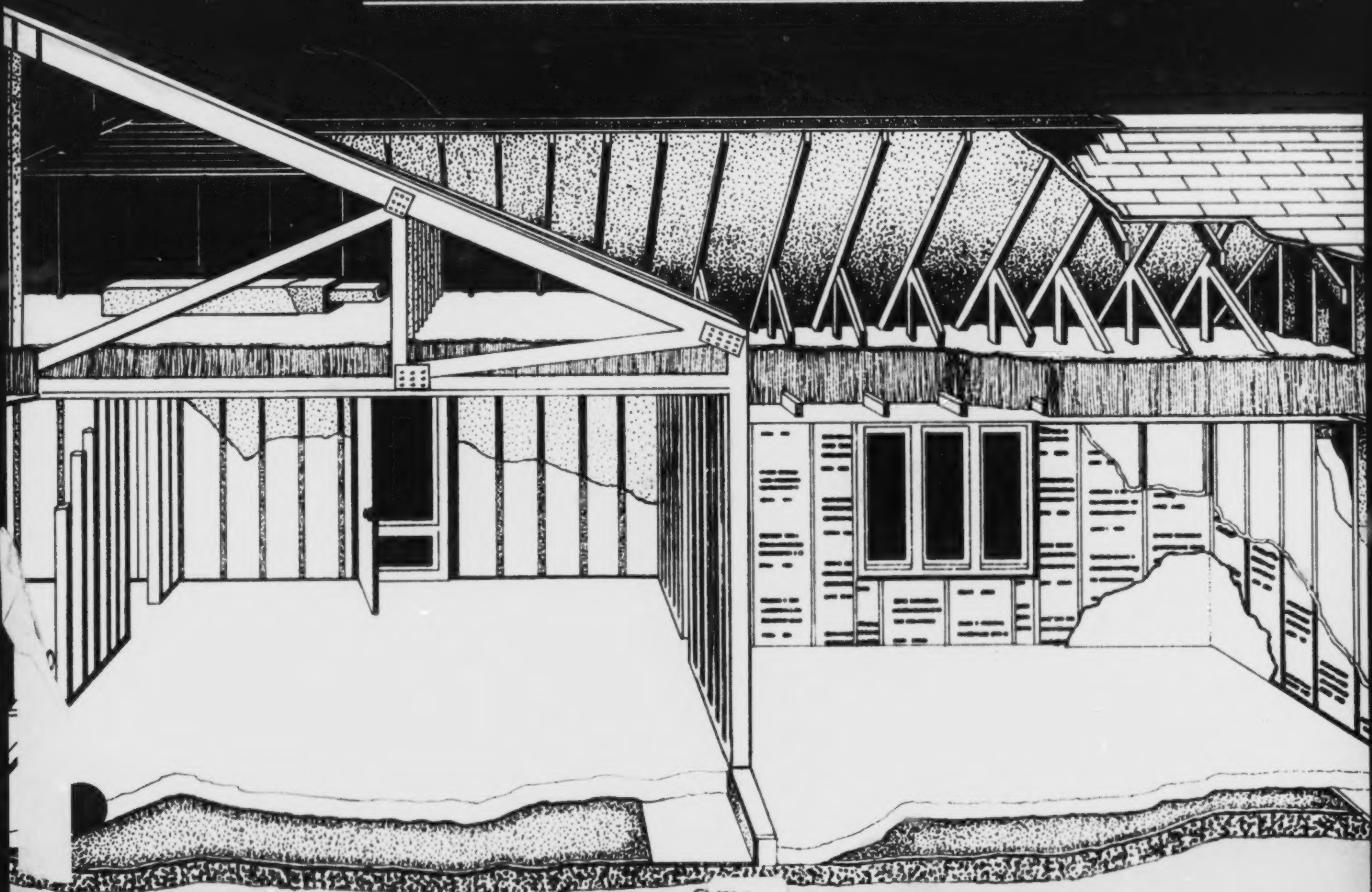
If there is a direct violation of the Court Order in Civil Action No. 5281 that cannot be cleared through negotiations, the sanctions required by the Court Order are applied.

TITLE VII, CIVIL RIGHTS ACT OF 1964; EXECUTIVE ORDERS 11246 AND 11375; TITLE IX, 1973 EDUCATION AMENDMENTS; REHABILITATION ACT OF 1973 AS AMENDED; 1974 AMENDMENTS TO THE WAGE-HOUR LAW EXPANDING THE AGE DISCRIMINATION IN EMPLOYMENT ACT OF 1967; AND VIETNAM ERA VETERANS READJUSTMENT ASSISTANCE ACT OF 1972 AS AMENDED IN 1974.

It is the policy of the Texas Education Agency to comply fully with the nondiscrimination provisions of all federal and state laws and regulations by assuring that no person shall be excluded from consideration for recruitment, selection, appointment, training, promotion, retention, or any other personnel action, or be denied any benefits or participation in any programs or activities which it operates on the grounds of race, religion, color, national origin, sex, handicap, age, or veteran status (except where age, sex, or handicap constitute a bona fide occupational qualification necessary to proper and efficient administration). The Texas Education Agency makes positive efforts to employ and advance in employment all protected groups.

Building Trades II

COMPETENCY TEST PACKET



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East Texas State University • Commerce, TX 75428

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BUILDING TRADES II
COMPETENCY TEST PACKET

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Trade and Industrial Education
Curriculum Specialist

Published by
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Commerce, Texas

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1990

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East Texas State University Commerce, TX 75428
(214)886-5624

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Edward J. Muller, *Reading Architectural Working Drawings*, ©1971, pp. 76, 156, 157, 158, 161, 174, 190. Reproduced by permission of Prentice Hall, Inc., Englewood Cliffs, New Jersey.

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Jonette Almon for editing.
Bob Norsworthy and Jason Frazer for Graphic Arts

Larry Hamlin
Curriculum Specialist
Trade and Industrial Education

PREFACE

The Educational Development and Training Center at East Texas State University is striving to provide needed materials to vocational instructors within the state.

The purpose of this publication is to assist instructors in improving instruction. As these materials are used, it is hoped that student performance will improve and students will be better prepared to assume a role in the field of building trades. These tests can be used for pretests or post tests. This publication extends the **Building Trades I Competency Test Packet**.

Instructional materials in this publication are written in terms of student performance, using measurable objectives. This approach augments the teaching-learning process. Criterion-referenced evaluation instructions are provided for uniform measurement of student progress. In addition to evaluating recall information, teachers are encouraged to evaluate the other areas, including progress and the finished product.

The instructor should, where appropriate, reinforce the application of basic academic skills. For example, when addressing the estimating construction costs area of study, the instructor should stress to students that they will be applying specific mathematical skills such as addition, subtraction, multiplication, and division that they have learned in previous academic courses. Effective teaching practices research, and consequently the Texas Teacher's Appraisal System, emphasizes the relationship of new learning to prior or future learning. In some cases, specific academic skills needed to complete job tasks may not have yet been addressed in the academic courses in which the students have been enrolled. If this is the case, the vocational instructor should introduce and explain the academic skills, and students should achieve a level of mastery that will allow them to perform the job tasks. Instructors of vocational courses are encouraged to work closely with instructors of academic courses to ensure that students are taught fundamental academic principles correctly.

Every effort has been made to make this publication basic, readable, and by all means, usable. Three vital areas of instruction (motivation, personalization, and localization) are not included in this publication; however, they should be capitalized on by the instructor. Only then will this publication really become a vital part of the teaching-learning process.

75.88 Trade and Industrial Education

(a) The elements in this subsection are common to all trade and industrial courses unless otherwise indicated and shall be included in each course at the appropriate level. They are described here to preclude repetitions in each course. Every school offering trade and industrial education shall provide courses which include the following essential elements:

(1) Leadership concepts and skills. The student shall be provided opportunities to:

(A) demonstrate skills, characteristics, and responsibilities of leaders and effective group members;

(B) demonstrate a knowledge of parliamentary procedure principles;

(C) plan and conduct leadership activities; and

(D) prepare for effective citizenship and for participation in our democratic society.

(2) Concepts and skills related to successful employment and/or postsecondary training. The student shall be provided opportunities to:

(A) identify employment opportunities and preparation requirements in chosen fields;

(B) identify effective methods to secure and terminate employment;

(C) demonstrate effective communication skills both oral and written and follow through on assigned tasks;

(D) demonstrate dependability and punctuality;

(E) demonstrate productive work habits and attitudes;

(F) understand the importance of taking pride in the quality of work performed;

(G) recognize the dignity in work;

(H) develop skills in planning and organizing work;

(I) apply required methods and sequences when performing tasks;

(J) apply principles of time management and work simplification when performing assigned tasks;

(K) identify ethical practices and responsibilities; and

(L) understand the importance of the application of organizational policies and procedures.

(3) Concepts and skills associated with entrepreneurship. The student shall be provided opportunities to:

(A) identify opportunities for business ownership;

(B) understand the risk and profit motive factor;

(C) understand the elements and advantages of the free enterprise system; and

(D) explain the role of small business in the free enterprise system.

(4) Concepts and skills related to safety and safe working conditions. The student shall be provided opportunities to identify and apply safe working practices to all training situations.

(5) Concepts and skills associated with human relations and personality development. The student shall be provided opportunities to:

(A) understand the importance of maintaining good health and proper appearance for effective job performance;

(B) understand oneself and others;

(C) exercise self-control;

(D) accept and use criticism;

(E) recognize basic human relationships as they relate to business success; and

(F) demonstrate characteristics for successful working relationships.

(6) Concepts and skills related to personal and business management. The student shall be provided opportunities to:

(A) explain how management assists in reaching personal and family goals;

(B) explain the management process;

(C) describe the role of management in controlling stress;

(D) identify and understand personal checking accounts;

(E) identify and understand personal loan application processes;

(F) identify and understand different financial institutions;

(G) identify the role and function of business management:

(H) understand the lines of authority; and

(I) identify effective supervisory techniques.

(7) Concepts and skills associated with the specific occupation being taught. The student shall be provided opportunities to:

(A) understand the basic concepts of and develop proficiency in the occupational area for which instruction/training is provided;

(B) develop a fundamental understanding of mathematical principles and scientific procedures;

(C) understand terminology utilized;

(D) identify tools, equipment, and materials used; and

(E) develop and demonstrate appropriate techniques for the selection, use, maintenance, and storage of tools, equipment, and materials.

ESSENTIAL ELEMENTS FOR BUILDING TRADES II

(e) Building trades (two-three units) shall include the essential trade and industrial education elements and the following essential elements:

(1) Concepts and skills associated with residential carpentry. The student shall be provided opportunities to:

(A) read blueprints and work drawings;

(B) identify and estimate costs of various building materials;

(C) demonstrate appropriate concrete form setting techniques;

(D) understand concrete placement and finishing procedures;

(E) utilize appropriate framing techniques including walls, floors, ceilings, rafters, and trusses;

(F) install roof flashing and covering;

(G) understand and demonstrate proper techniques in door and window installation;

(H) identify and install various exterior and interior wall covering and trim; and

(I) understand proper techniques in stair framing.

(2) Concepts and skills associated with bricklaying. The student shall be provided opportunities to understand construction processes utilized in the construction of stonewalls, foundation walls, repairing cracks, and blueprint reading.

(3) Concepts and skills associated with residential electrician. The student shall be provided opportunities to:

(A) understand schematic diagrams and symbols; and

(B) understand the installation of electric service, wiring, and fixtures.

(4) Concepts and skills associated with painting and decorating. The student shall be provided opportunities to understand the basic principle of drywall, interior, and exterior finishes.

(5) Concepts and skills associated with plumbing. The student shall be provided opportunities to understand the process and sequence of installing external and internal plumbing in residential construction.

REFERENCE: *Building Trades I*, Unit 1

II-1-CT

COMPETENCY TEST

CARPENTRY

NAME : ______________________________ **DATE:** ____________________

UNIT: Blueprints and Working Drawings

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.

DIRECTIONS: Read and answer the following questions in the space provided.

1. What other term is used for a set of blueprints?

2. Why are details and sectional views used?

3. Why are views shown at a larger scale?

4. What views are shown through the narrow width of the building?

5. What views are shown through the long dimensions?

6. Name three special features shown in details.

7. Views such as retaining walls are shown for what reason?

8. Why would plumbers need to make a sketch?

9. What type of paper is used for sketching?

10. Why are sketches made by different craftsmen?

II-2-CT

COMPETENCY TEST

CARPENTRY

NAME : ______________________ **DATE:** ______________

UNIT: Floor Systems

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to lay reinforcement for slab floors and construct subfloors correctly.

DIRECTIONS: Read and answer the following questions in the space provided.

1. At what level is a slab floor poured?

2. Concrete floors are used in what areas?

3. What is a floating slab construction called?

4. Where should the footings rest?

5. What types of reinforcement are used in slab floors?

6. Why should solid lumber beams be kept dry?

7. Why could you lay strip flooring in any direction with a plywood floor?

Choose the correct word(s) to complete each statement.

8. The __________ board should be laid first on a diagonal floor.

A. shortest
B. widest
C. longest
D. none of the above

9. A __________ is used to mark across the top of the joist.

A. tape measure
B. board and pencil
C. chalkline
D. none of the above

10. The shorter board should be used __________ of the floor.

A. in the middle
B. on the left side
C. in the corner
D. on the side

11. A carpenter needs 2,020 square feet of plywood to put down a subfloor. There are 980 square feet of plywood on hand. How many square feet of plywood must the carpenter order?

12. A carpenter estimates a job requiring 550 board feet of lumber. An additional 15% is allowed for waste. How many board feet are allowed for waste?

13. A deck is covered by 35 boards. Each board is 1 3/4 inches wide. What is the total width of the deck?

14. A contractor budgets $147,000.00 for labor. How many hours of labor can be hired if labor cost is $14.00 per hour?

15. Four carpenters working together laid 8,280 square feet of flooring in one day. What was the average number of square feet laid by each carpenter that day?

II-3-CT

COMPETENCY TEST

CARPENTRY

NAME : ______________________________ **DATE:** ________________

UNIT: Stairway Systems

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct stairway systems correctly.

DIRECTIONS: Using the correct term, fill in the blanks:

1. The run of a stairway is the _________ length from one end to the other end.

2. The nose of a tread is the part that overlaps the _________.

3. The _________ and ________ support the treads and risers.

4. A _________ is required on most stairways.

5. The balusters and the handrail combination is called the _________.

6. The balusters are connected to the tread with a round or square _________.

Read and answer the following questions in the space provided.

7. How are stair dimensions shown for clarification?

8. Why should a carpenter check blueprint dimensions?

9. A carpenter should lay out a stairway on paper to see if it meets what requirements?

10. How are the semihoused stringers laid out and cut?

11. If a set of steps is five risers high and each riser is 7 1/4 inches, what is the total rise of the steps?

12. A flight of 27 stairs has 4 risers, each 7 7/8" high. What is the total rise of the flight?

13. A 2" x 6" x 16′ long board contains how many board feet?

14. A 1" x 4" x 6′ long board contains how many board feet?

COMPETENCY TEST
CARPENTRY

NAME : ______________________ DATE: ______________

UNIT:	Wall Systems
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to construct bearing partitions, nonbearing partitions, and metal frames correctly.
DIRECTIONS:	Read and answer the following questions in the space provided.

1. Explain what the markings on a story pole represent.

2. The markings on a story pole are for what part of the wall frame?

3. The story pole is useful in what type of construction?

4. The story pole is a must for what type construction?

5. What is erected as soon as the outside walls are completed?

6. The roof trusses are supported entirely by what?

7. What type partition does not require headers?

8. How is the sole plate removed after the wall is set?

9. Why is metal framing prefabricated?

10. How are the metal parts put together?

11. How many 16" braces can be cut from a piece of lumber 340 inches long?

12. A carpenter has a 2" x 6" x 20′ board. How many 3 foot lengths can be cut from this piece of lumber?

13. How many joists, spaced 16" on center, will be required for a floor 64 feet long?

14. A 2" x 6" x 16′ long board contains how many board feet?

15. Three 1" x 12" x 10′ long boards contain how many board feet?

II-5-CT

COMPETENCY TEST

CARPENTRY

NAME : ______________________________ DATE: ________________

UNIT: Door and Window Installation

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install sliding glass doors, pocket doors, and windows correctly.

DIRECTIONS: Indicate if the statement is true or false by circling the T or F.

T F 1. Pocket-type doors slide into the wall.

T F 2. Pocket doors always have hardware on them.

T F 3. The door thickness is 2".

T F 4. The rough door opening is 6′ 11 1/2" or 7′ high.

T F 5. The header must support any weight on the wall.

T F 6. The pocket frame is installed with 10d finish nails.

T F 7. The door and stops are installed after wall covering is complete.

T F 8. Long nails can be used.

T F 9. Short nails should be used in baseboards and trim.

T F 10. If wall covering nails are too long, they will scratch the door.

11. A blueprint calls for one wall to be done in 1′ x 4′ windows. The wall is 108 inches long. How many windows can be installed when connecting mulls are 13 inches wide?

II-6-CT

COMPETENCY TEST

CARPENTRY

NAME : ______________________________ **DATE:** ____________________

UNIT: Interior Finish

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install moisture-resistant wallboard, light fixtures, and floor coverings, and construct bookcases and room dividers correctly.

DIRECTIONS: Indicate if the statement is true or false by circling the T or F.

T F 1. Gypsum wallboard is made to use in moist or high humidity areas.

T F 2. For identification, the facing paper is a light brown.

T F 3. This type wallboard comes in only 8-foot lengths.

T F 4. Moisture-resistant wallboards are used mostly in bathrooms.

T F 5. There should be 1/4-inch of space between wallboard and tub lip.

T F 6. Divider walls are used in all houses.

T F 7. The divider wall is used to separate rooms into two or more parts.

T F 8. Divider walls can be purchased assembled.

T F 9. Divider walls can be various sizes.

T F 10. Some divider walls have openings.

11. If a drywall contractor paid $480.00 for drywall, $13.00 for tape, $81.00 for joint compound, and $35.00 for screws, what was the total cost of the materials?

12. A carpenter needs a door jamb to cover the end of a wall that has 3/8 inch paneling and 1/2 inch plasterboard on each side of a 3 1/2 inch wall stud. How wide should the jamb be?

13. When hanging a door over subflooring, the door must clear the carpeting by 1/8 inch. The carpet pad is 1/2 inch thick and the carpet is 9/16 inch thick. What is the height above the subflooring?

14. There are 296 drywall nails per pound. How many nails are in 1/4 pound?

II-7-CT

COMPETENCY TEST

CARPENTRY

NAME: ______________________ **DATE:** ______________

UNIT: Exterior Finish

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install exterior finishes correctly.

DIRECTIONS: Read and answer the following statements. Indicate true or false by circling the T or the F.

T F 1. All exterior materials are covered when the term "exterior finish" is used.

T F 2. The exterior finish does not include special woodwork design.

T F 3. The carpenter determines details for cornice construction.

T F 4. Details and design are determined by an architect.

T F 5. Wood shingles are used only on the roof.

T F 6. Vertical siding is used only on main walls.

T F 7. You should use 8d nails, no more than 4 ft. apart when installing vertical siding.

T F 8. The batten is installed with 12d nails.

T F 9. The batten should be nailed in the center with 10d nails.

T F 10. Plywood batten is placed only on cracks.

11. A contractor ordered 12 bundles of shingles. Each bundle contained 250 shingles. How many shingles were in the total order?

12. A contractor figured labor would cost $90.00 per day for one worker. What would be the total labor cost for 5 days if 11 workers are employed?

13. A 4′ x 8′ sheet of plywood is 32 square feet. How many sheets would be needed to roof a deck 2,176 square feet with no waste allowance?

14. A contractor spent $141.72 for shingles, $16.81 for felt paper, and $6.27 for flashing. What is the total cost of the roofing materials?

15. If a roofer takes 12.6 hours to lay 1,680 square feet of roofing, how long does it take him to lay 100 square feet of roofing?

COMPETENCY TEST

MASONRY

NAME : ________________________ **DATE:** ____________

UNIT: Orientation

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to demonstrate an awareness of career opportunities in the masonry field correctly.

DIRECTIONS: Read and answer each of the following questions in the space provided.

1. Bricklayers and stonemasons need a thorough knowledge of what?

2. What are four other occupations involving similar skills?

3. How many bricklayers and stonemasons are self-employed?

4. In which jobs do self-employed masons specialize?

5. What age should the apprentice be?

6. What is a journeyman mason?

Read each of the following statements. Indicate if the statement is true or false by circling T or F.

T F 7. Masons have to be able to read blueprints.

T F 8. Terrazzo workers do not work with masons.

T F 9. A tile setter does work similar to bricklayers and stonemasons.

T F 10. The bricklayers and stonemasons have to serve as apprentices.

11. If a mason deposited $1,000.00 in savings at 5% interest per year, how much interest would he earn at the end of 12 months?

12. A mason purchased a piece of equipment for $2,500.00 on time and agreed to pay 8% interest per year. How much interest would be owed in 12 months?

13. If a contractor borrowed $500.00 at 8% for 12 months, the interest to be paid would be what for the 12 months?

14. If a mason could lay 180 bricks in an hour, how many could he lay in 6 hours?

15. If an average weight of terrazzo is 2.5 pounds per square foot, what is the total weight of the terrazzo on a 831.75 square foot area?

III-2-CT

COMPETENCY TEST

MASONRY

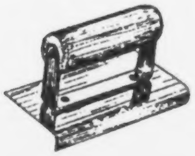
NAME : ______________________________ DATE: ____________________

UNIT: Tools and Materials

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to demonstrate the correct use of finishing tools and heavy equipment used in bricklaying/stone masonry.

DIRECTIONS: Identify each of the following masonry tools by placing the correct letter in the blank provided and give a brief description of each.

A. MASH HAMMER
B. POWER JOINT CUTTER
C. EDGER
D. GROOVER
E. FACE HAMMER
F. BUSH HAMMER
G. DARBY
H. FLOAT
I. METAL CONCAVE BEADING TOOL



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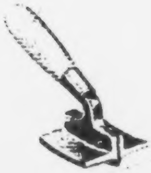

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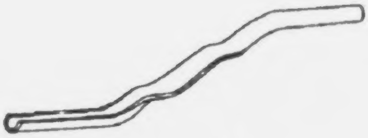

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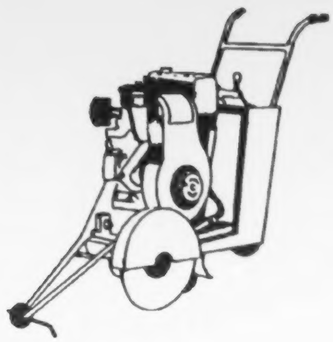

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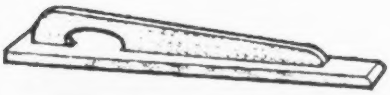

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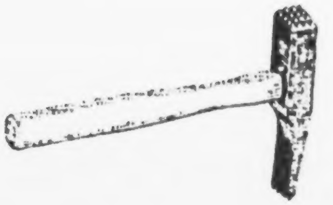

6. ____________________

7. ____________________

8. ____________________

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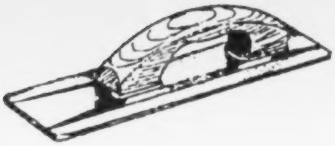


9. ______________________________

Read and answer each of the following questions in the space provided.

10. How may power trowelers be powered?

11. A trowler is used to give what type of finish?

12. If the tool shed usually has 100 tools and fourteen of them are missing, what percent of the tools are missing?

13. A contractor bought a compressor regularly selling for $120.00 at a sale, and saved 20 percent. How much money did he save?

III-3-CT

COMPETENCY TEST

MASONRY

NAME : ______________________ **DATE:** ______________

UNIT: Basic Information for Bricklaying/Stonemasonry

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to mix mortar, build a stone wall, and clean stone work correctly.

DIRECTIONS: Read and answer each of the following questions in the space provided.

1. Why should mortar have water sprinkled on it?
2. What are the two distinct sets of mortar?
3. To resist repeated cycles of freezing and thawing is known as what?
4. The stone wall will depend on what for strength and stability?
5. What can be added to give the wall strength and support?
6. What will happen if stone mortar is too rich?

7. What type mortar should be used for stone work?

8. Why is mortar not absorbed quickly when doing stone work?

9. What is used to clean stone work?

10. What is not permitted to be used on stone work?

11. A mason contracts a job for $700.00. The labor cost was $316.00, material cost was $203.00, and other expenses totaled $78.00. How much profit was made?

12. Weight slips for four loads of gravel delivered to the job site were 6,282 lb., 6,099 lb., 6,140 lb., and 6,195 lb. What is the total weight of gravel delivered to the job site?

13. What is the cost of 20 bags of cement if each bag costs $3.50?

14. A mason estimated the following amounts of mortar required for a job: 5 1/2 cubic yard, 11 1/3 cubic yard, and 6 1/4 cubic yard. What would be the total amount of mortar needed for the job?

COMPETENCY TEST

MASONRY

NAME : ______________________ DATE: ______________

UNIT: Construction Processes

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct foundation, damp-proof, and cavity walls, and repair wall cracks correctly.

DIRECTIONS: Read and answer the following questions in the space provided.

1. The hollow foundation wall must be capped with what, and why?

2. What is the most common type of foundation wall?

3. How long should the first parge coat dry?

4. What should be done to keep water from collecting at a footing?

5. How long should the second parge coat be moist-cured?

6. The cavity wall is built of masonry units to provide what?

7. How can silicons be applied to masonry walls?

8. Which type will best penetrate the masonry wall?

Choose the correct term to complete each statement.

9. One of the most common cracks is ________ caused by expansion and contraction of the wall.

A. settlement
B. corner
C. offset
D. expansion

10. Settlement cracks usually run in a _________ position.

A. horizontal
B. parallel
C. vertical
D. straight line

11. A mason lays 72 feet of sidewalk that represents 40% of the total job. What is the total length, in feet, of the completed sidewalk?

12. If a concrete mason can install an average of 170 square feet of topping per hour, how many square feet can he install in 48 hours?

13. If a concrete mason used 330 lineal feet of two-by-fours on one form, 570 lineal feet on another, and 275 on another, how many lineal feet were used?

14. Figure the amount of time worked in 4 weeks by 12 masons who worked 30 hours each week.

15. A contractor built 26 houses. The project required 25,350 square feet of concrete. How much concrete was required, on average, per house?

913

COMPETENCY TEST

MASONRY

NAME : ______________________________ **DATE:** ____________________

UNIT:	Blueprints and Working Drawings
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to read and interpret blueprints and working drawings correctly.
DIRECTIONS:	Read and answer each of the following questions in the space provided.

1. The residential floor plans are drawn at ______ scale.

2. Define size.

3. Define scale.

4. Every 1/4 inch on the drawing is equal to what?

5. Using the 1/4" = 1' 0" scale, 7' 6" would read _________ on a folding rule to scale a plan.

   A. 2 1/8"
   B. 1 1/4"
   C. 1 5/8"
   D. 1 7/8"

6. What is another name for specifications?

7. The drawings that all parties concerned in the project use are _________.

8. What are the two major sections of the specifications?

9. Explain what the general conditions are on blueprints.

10. The trade work and actual building of the structure is found in what sections of a blueprint?

COMPETENCY TEST
RESIDENTIAL ELECTRICIAN

NAME : ________________________ DATE: ______________

UNIT: Electrical Safety

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to demonstrate skills associated with electrical safety correctly.

DIRECTIONS: Circle the letter of the term(s) that best completes each statement.

1. The size of the grounding conductor is determined by the size of the __________ in a system.

   A. ground rods   C. service conductors
   B. breakers   D. size wire

2. System grounding is the connection of the __________ to the earth.

   A. conduit   C. transformer
   B. service panel   D. neutral conductor

3. System and equipment grounding should be made at the same __________ entrance with one or more grounds.

   A. panel box   C. pipe system
   B. service   D. ground rod

4. If a ground rod is used, a __________ shaped rod is best to use.

   A. round   C. hexagon
   B. square   D. star

5. In areas where moisture is salty or acidic, only rods made of _________ material should be used.

   A. iron   C. steel
   B. corrosive   D. non-corrosive

6. What would be the voltage drop of 100 feet of AWG 10 copper wire carrying 30 A?

7. What percentage of 87 is 14?

8. If a contractor purchases $240.00 worth of electrical supplies and pays for the purchase within ten days, he gets a 5% discount. How much will he save by paying before the ten days are up?

IV-2-CT

COMPETENCY TEST
RESIDENTIAL ELECTRICIAN

NAME : ______________________________ **DATE:** ____________________

UNIT: Electrical Theory

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to construct an electrical circuit correctly.

DIRECTIONS: Answer the questions in the spaces provided.

1. What will happen in a series circuit if one or more of the lights burn out?

2. Draw a sketch of a series circuit using five lamps.

3. Draw a sketch of a parallel circuit using five lamps.

4. Assess the K-values for ohms resistance for brass, aluminum, and copper.

5. As more units are connected to a parallel circuit, would the current decrease or increase?

6. The neutral wires are usually what color?

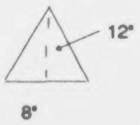
7. What number of wire size can be either solid or stranded?

8. The number 6, 4, and 2 wires are always __________.

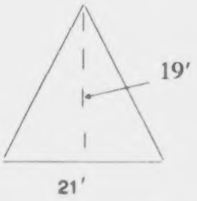
9. The devices that protect the circuits are fuses and _________, and they will also turn circuits on and off.

10. Compare why it is more convenient to have switches than breakers only.

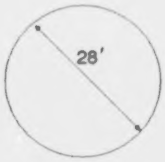
11. Calculate the area for a triangle.



12. Calculate the area for a triangle.



13. Calculate the area of a circle, use $\pi = 3.14$.



14. Using the formula R = E/I, calculate and find the resistance for 440 volts, 10 amps.

15. Using the formula I = E/R, find the amperage for 120 volts, 40 ohms.

IV-3-CT

COMPETENCY TEST
RESIDENTIAL ELECTRICIAN

NAME : ______________________ **DATE:** ______________

UNIT:	Blueprints and Drawings
UNIT OBJECTIVE:	After completing this unit, the student(s) will be able to demonstrate the knowledge and ability to read and interpret blueprints and drawings correctly.
DIRECTIONS:	Read the following questions and answer in the space provided.

1. On what plans are switches and outlets shown?

2. Who does the routing of circuits and wiring?

3. If a 240-volt oven range required a 50-amp circuit breaker, it would be carrying _________ watts.

4. Classify what type of wire is specified for most projects.

5. What is the smallest wire to be used in a branch circuit according to the *N.E.C.*?

6. The _________ is usually given the plans.

7. If a switch controls an outlet, it is shown by a ________ .

8. Discuss how blueprints are used as a work record.

9. When one or more lights can be controlled from two entrances a ________ switch is used.

10. Identify what type of box is required for outside wiring.

IV-4-CT

COMPETENCY TEST
RESIDENTIAL ELECTRICIAN

NAME : ______________________________ **DATE:** ________________

UNIT: Electrical Installation

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install ceiling fans, room air-conditioning units, garbage disposals, and ballast protectors.

DIRECTIONS: Circle the letter of the correct response to complete each statement.

1. Most ceiling fans are supported by a ________ bracket.

   A. plastic
   B. metal
   C. wood
   D. wire

2. A 32-inch ceiling fan will draw ________ watts.

   A. 30 to 40
   B. 50 to 80
   C. 60 to 80
   D. 50 to 70

3. A ________ power supply should be used for ceiling fans.

   A. 110-volt
   B. 120-volt
   C. 220-volt
   D. 240-volt

Complete the following statements by writing the correct word(s) in the blank.

4. Room air conditioners are usually rated from 4 to ________ ampere.

5. The 240-volt air conditioner would be put on a _________ double-pole breaker.

6. Room air conditioners can also be tied into the same circuit as ________.

7. Disposals are usually operated by ________ volts.

8. Disposals attach to the bottom of the ________.

9. The ________ can be used in-line for ballast protection.

10. To replace a ballast, the _________ should be removed.

11. Using the formula $E = IR$, find the voltage for 20 amps, 6 ohms.

12. Using the formula $E = IR$, find the voltage for 9.6 amps, 2.5 ohms.

13. Using the formula $I = E/R$, find the amperage for 440 volts, 20 ohms.

V-1-CT

COMPETENCY TEST

PAINTING AND DECORATING

NAME : ______________________ DATE: ______________

UNIT: Surface Preparation

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to apply safety principles when correctly preparing walls and will be able to estimate paint accurately.

DIRECTIONS: Read and answer the following questions by circling the **T** for **TRUE** or **F** for **FALSE**.

T F 1. Ladders and scaffolds should be put away when not in use.

T F 2. Rags and cleaning supplies should be disposed of after use.

T F 3. Fumes from thinner and oil-based paints could cause fires.

T F 4. The paint and thinner can labels have first-aid information on them.

T F 5. Electrical plates and fixtures can be removed with electricity on.

T F 6. Cracked and peeling surfaces can be wiped off.

T F 7. Liquid sand can be used on a gloss surface before painting.

T F 8. A stiff putty knife should be used with filler.

T F 9. Excess filler should be left on and sanded down.

T F 10. A thinned coat of paint can be used for primer.

11. A drywall hanger needs a piece of sheetrock 88 inches long. Using 8′ sheetrock, how much will need to be cut off?

12. A drywall hanger needs a piece of sheetrock 98 inches long. Using 10′ sheetrock, how much needs to be cut off?

COMPETENCY TEST

PAINTING AND DECORATING

NAME : ______________________________ **DATE:** ____________________

UNIT: Painting

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to apply primers, special paints, and special effects correctly.

DIRECTIONS: Read and answer the following questions by circling **T** for true or **F** for false.

T F 1. You would need a special type paint for ceramic tile.

T F 2. Primers are made just for wood surfaces.

T F 3. Zinc chromate is white in color.

T F 4. Special paints and primers prevent corrosion and provide adhesion.

T F 5. Epoxy paints will not leave brush marks.

T F 6. Epoxy paint is usually used on non-porous surfaces.

T F 7. Textured paint is usually applied with a trowel or carpet roller.

T F 8. Textured surfaces use less paint when they are repainted.

T F 9. Textured paints reduce the glare.

T F 10. When applying heat resistant paint, the surface does not have to be cleaned.

COMPETENCY TEST

PAINTING AND DECORATING

NAME : ______________________________ DATE: ________________

UNIT: Wall Finish Techniques

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to apply textures and wall coverings correctly and estimate their cost accurately.

DIRECTIONS: Read and answer the questions in the space provided.

1. What term is used for how a wall feels and looks when touched?

2. A wall with cork on it is one type of what?

3. What can be used in some rooms for a natural appearance?

4. Could straw mats be used as a wall texture?

Choose the correct term to complete each statement.

5. Special type coverings are ________ to clean.

A. easy
B. hard
C. washed
D. steamed

6. With brown tones, ________ is good to use in a den or recreation room.

A. grasscloth
B. cork
C. linen
D. burlap

7. The burlap and hemp coverings are similar to the ________.

A. linen
B. cork
C. strawpaper
D. grasscloth

8. The grasscloth is available in natural material as well as ________ materials.

A. colored
B. embossed
C. polyvinyl
D. synthetic

9. Special type coverings let you ________ your own wallcovering.

A. hang
B. design
C. clean
D. use

10. Special type coverings help to ________ flaws on walls.

A. disguise
B. improve
C. color
D. none of the above

VI-1-CT

COMPETENCY TEST

PLUMBING

NAME : ______________________________ **DATE:** ____________________

UNIT: Plumbing Tools and Materials

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to use plumbing tools and materials when correctly installing plumbing fixtures.

DIRECTIONS: Read and answer each of the following questions in the space provided.

1. For what is the garbage disposal used?

2. How are disposals installed?

3. The water closets and urinals are operated with what?

4. The water fountain is usually installed where?

5. What operates the disposal?

6. How is a flush valve operated?

7. Summarize how the water fountain works and is installed.

8. Why are hard materials not put in the disposal?

9. Where should the garbage disposal be installed and why?

10. Who would install the garbage disposal and why?

COMPETENCY TEST

PLUMBING

NAME: ______________________ **DATE:** ______________

UNIT: Fundamentals of Plumbing

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to interpret symbols and sketches correctly when repairing drainage and water systems.

DIRECTIONS: Choose the correct response to complete each statement.

1. Most plans for residential structures do not show ________ on the drawing.

   A. electrical
   B. piping
   C. wall framing
   D. foundations

2. The ________ symbol is used when a heater is shown on sketches and drawings.

   A. (S)
   B. (O)
   C. (DW)
   D. (H)

3. The measurement system normally used is ________ on plans and drawings.

   A. 1/5" = 1'-1"
   B. 1/4" = 1'-0"
   C. 1/8" = 1'-0"
   D. 1/2" = 1'-0"

Read and answer the following questions in the space provided.

4. What is used to clean stoppage in pipes?

5. Why should you leave water running when removing a plumber's snake?

6. Why are galvanized pipes more likely to leak at the threads?

7. How can a leak be repaired without replacing the pipe?

8. Why does plastic pipe last longer than galvanized pipe?

9. When will plastic pipe bend easily when being installed?

10. If a plastic fitting leaked, what would need to be replaced?

11. If you have 542 lineal feet of plastic pipe, and you need 1,702 lineal feet to complete the job, how many more lineal feet will you need?

VI-3-CT

COMPETENCY TEST

PLUMBING

NAME: ______________________________ **DATE:** ____________________

UNIT: Plumbing Installation

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to install gas water heaters correctly.

DIRECTIONS: Read and answer each of the following questions in the space provided.

1. What is used to let pressure escape from the water tank?

2. How and why is the gas hot water heater vented out?

3. What procedure is used to check for gas leaks?

4. How often should sediment be removed?

5. What would be an advantage of an electric heater?

6. Where would a water valve be placed when installing a water heater?

7. What should be used to vent a water heater?

8. Why is it necessary to install a relief valve?

9. What is the last operation you would do when installing the heater?

10. Why is an electric heater preferred over a gas heater?

11. What is the difference in diameter between 1/2 inch copper tubing and 5/8 inch copper tubing?

COMPLIANCE STATEMENT

TITLE VI, CIVIL RIGHTS ACT OF 1964; THE MODIFIED COURT ORDER, CIVIL ACTION 5281, FEDERAL DISTRICT COURT, EASTERN DISTRICT OF TEXAS, TYLER DIVISION

Reviews of local education agencies pertaining to compliance with Title VI Civil Rights Act of 1964 and with specific requirements of the Modified Court Order, Civil Action No. 5281, Federal District Court, Eastern District of Texas, Tyler Division are conducted periodically by staff representatives of the Texas Education Agency. These reviews cover at least the following policies and practices:

(1) acceptance policies on student transfers from other school districts;

(2) operation of school bus routes or runs on a non-segregated basis;

(3) nondiscrimination in extracurricular activities and the use of school facilities;

(4) nondiscriminatory practices in the hiring, assigning, promoting, paying, demoting, reassigning, or dismissing of faculty and staff members who work with children;

(5) enrollment and assignment of students without discrimination on the basis of race, color, or national origin;

(6) nondiscriminatory practices relating to the use of a student's first language; and

(7) evidence of published procedures for hearing complaints and grievances.

In addition to conducting reviews, the Texas Education Agency staff representatives check complaints of discrimination made by a citizen or citizens residing in a school district where it is alleged discriminatory practices have occurred or are occurring.

Where a violation of Title VI of the Civil Rights Act is found, the findings are reported to the Office for Civil Rights, Department of Health, Education and Welfare.

If there is a direct violation of the Court Order in Civil Action No. 5281 that cannot be cleared through negotiation, the sanctions required by the Court Order are applied.

TITLE VII, CIVIL RIGHTS ACT OF 1964; EXECUTIVE ORDERS 11246 AND 11375; TITLE IX, 1973 EDUCATION AMENDMENTS; REHABILITATION ACT OF 1973 AS AMENDED; 1974 AMENDMENTS TO THE WAGE-HOUR LAW EXPANDING THE AGE DISCRIMINATION IN EMPLOYMENT ACT OF 1967; AND VIETNAM ERA VETERANS READJUSTMENT ASSISTANCE ACT OF 1972 AS AMENDED IN 1974.

It is the policy of the Texas Education Agency to comply fully with the nondiscrimination provisions of all federal and state laws and regulations by assuring that no person shall be excluded from consideration for recruitment, selection, appointment, training, promotion, retention, or any other personnel action, or be denied any benefits or participation in any programs or activities which it operates on the grounds of race, religion, color, national origin, sex, handicap, age, or veteran status (except where age, sex, or handicap constitute a bona fide occupational qualification necessary to proper and efficient administration). The Texas Education Agency makes positive efforts to employ and advance in employment all protected groups.